INTERVIEW: COMMUNICATIONS MINISTER DAVID BEDDALL

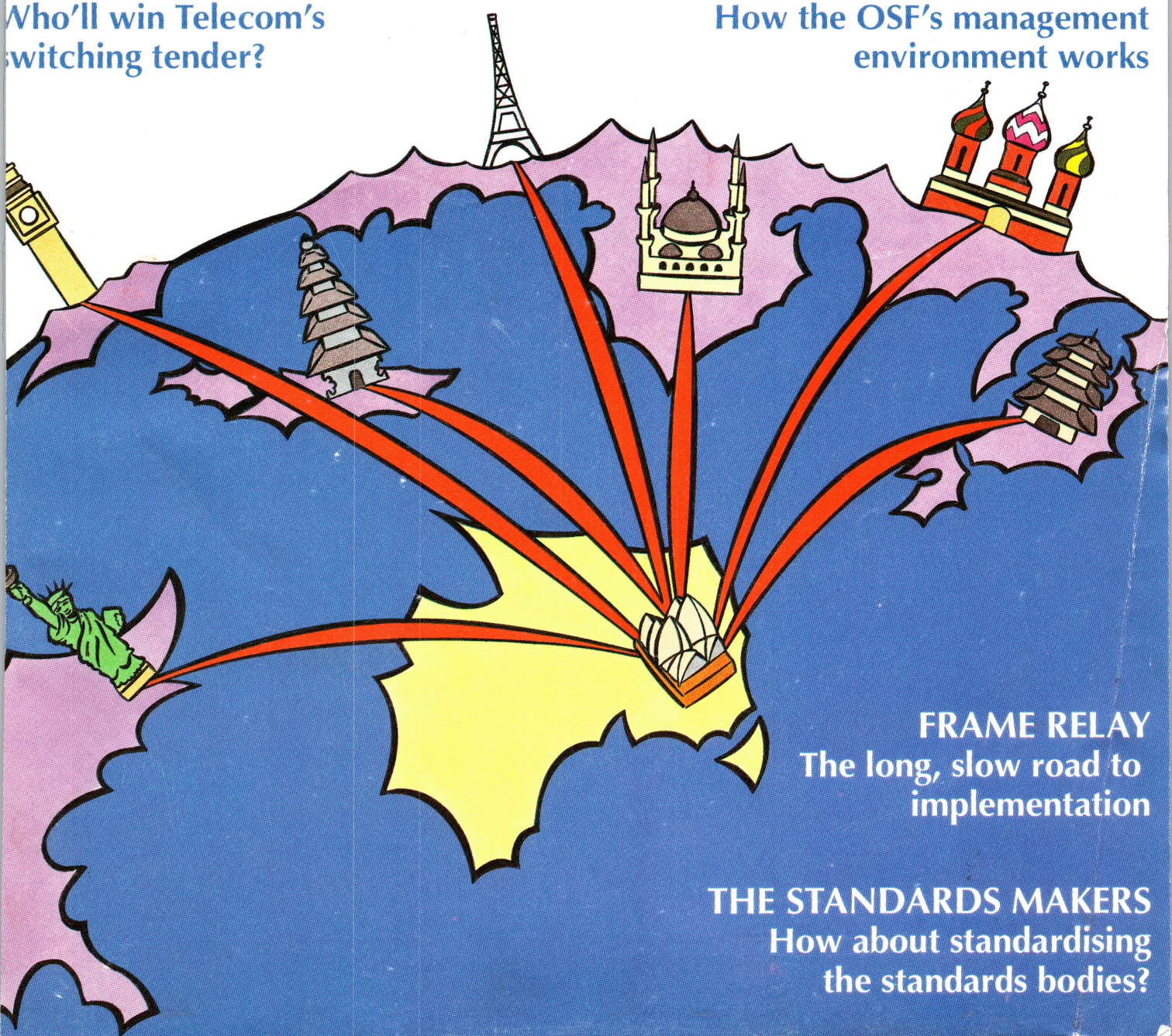
AUSTRALIAN
communications

NOVEMBER 1993 The Networking and Telecommunications Management Magazine $5.50

THE WORLD OF WORKGROUP NETWORKING

SWITCH WARS
Who'll win Telecom's switching tender?

DECIPHERING DME
How the OSF's management environment works



FRAME RELAY
The long, slow road to implementation

THE STANDARDS MAKERS
How about standardising the standards bodies?

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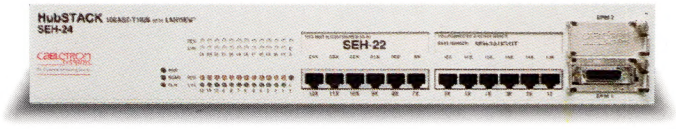

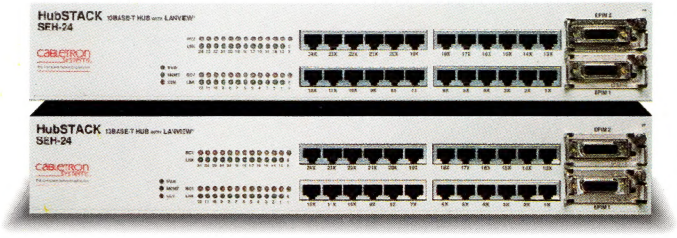

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November

1-4 **Token Ring Networks, and Troubleshooting Token Ring Networks**, IIT Training, Sydney. These two courses are designed to give attendees an in-depth view of Token Ring networking and associated standards. The Token Ring Networks course involves designing, building and implementing a network in a live environment, while the Troubleshooting course teaches diagnostics and fault finding techniques to reduce downtime. Fee: Token Ring Networks (3 days) $1,445; Troubleshooting Token Ring Networks (1 day) $350. Enquiries — IIT Training Tel: (02) 252 2844 Fax: (02) 247 1048.

9-12 **LAN-WAN Asia '93**, Kowloon Shangri-La Hotel, Hong Kong. This top-level summit looks at the new choices for public networks and the planning issues facing large corporate and government private networks in the Asian region. It will examine how technologies inter-relate, and provide an update on standards. There will also be three half-day workshops on frame relay, SNA internetworking and ATM. Fee: Three-day conference $US1,795; conference and one workshop $US1,995; conference and two workshops $US2,195. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

10-12 **Network Cabling Design**, The Sheraton Hotel, Melbourne. This hands-on course will explain the cost-effectiveness of various media, cabling standards, construction and transmission methods, regulatory constraints on in-building wiring, preparing cost estimates and future trends. Fee: $1,445. Enquiries — IIT Training (02) 252 2844 Fax: (02) 247 1048.

15-16 **ATM '93**, Sydney Renaissance Hotel, Sydney. This event provides delegates with the latest information on making the transition to ATM technology, and features experts who will discuss how to seamlessly integrate local and wide area networks through ATM. Fee: $1,295. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

16-18 **Middle East & Gulf Mobile Communications — Implementing New Digital Mobile Communications Systems**, Inter-Continental Hotel, Dubai. Concentrating on GSM and being held at a critical time in the region's development of mobile systems, this conference will examine operational experiences with the implementation of GSM cellular networks, the issues surrounding standards and roaming, and the future impact of other mobile services. A technical day will allow delegates to understand the practicalities of building a successful and profitable network. Enquiries — IBC Technical Services Tel: +44 71 637 4388 Fax: +44 71 631 3214.

17-19 **Client Server Computing**, Hotel Nikko, Potts Point, Sydney. This event takes an in-depth look at client server computing technology, and shows how the move to client server can improve efficiency and business competitiveness. A one-day workshop will feature a realistic case study to examine design and implementation issues. Fee: two-day conference $1,295; conference and workshop $1,895; workshop only $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

24-25 **Global Networks**, Sydney Renaissance Hotel, Sydney. This two-day event looks at how businesses can create their own organisational network which spans the globe and facilitates intra and inter data transfers, voice communications and the transmission of live images. The agenda covers the international services currently available to businesses, the latest technologies which are making global networks possible, and the way they interface with the domestic communications network, the securities issues involved, the legal requirements for global networks, and the way in which virtual private networks successfully operate on a global level. Fee: $1,295. Enquiries — AIC Conferences Tel: (02) 210 5700 Fax: (02) 221 7773.

28-1/12 **ACOFT-18 '93**, Northbeach Parkroyal Hotel, Wollongong. The 18th Australian Conference on Optical Fibre Technology will cover the latest research, developments, production applications and business strategies of optical fibres, waveguides, sources, detectors and other services for the telecommunications and sensors industries. A trade exhibition will be held in conjunction with the conference. Enquiries — Conference Secretary, IREE Tel: (02) 327 4822 Fax: (02) 362 3229.

29-30 **Telecommunications Pricing and Cost Control**, Golden Gate Hotel, Sydney. This conference is designed for those who need in-depth knowledge of how competition and regulation will affect the cost of telecommunications. Participating organisations will include Austel, Telecom, Optus, AAP Telecommunications and the Cellular Dealers Association. Fee: $1,295. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

29-3/12 **Australian Data Communications**, Sydney. This 2-day seminar and 3-day workshop covers all aspects of the fundamentals of the Australian data comms environment. Fees: 2-day seminar $875; 3-day workshop $1,315; 5-day combined course $1,965. Enquiries — Housley Computer Communications Tel: (02) 499 2666 Fax: (02) 498 7669.

30-4/12 **Vietnam Telecomp '93**, The Vietnam Exhibition and Fair Centre, Hanoi. This exhibition covers telecommunications, computers, broadcasting and office equipment, and gives exhibitors a chance to break into Vietnam's telecoms and data communications markets. Last year the event attracted over 30 vendors from 14 countries. Enquiries — Adsale Exhibition Services Tel: +852 511 0511 Fax: +852 507 5014.

December

1-3 **The Pan-Asian PCS '93 Summit**, Conrad Hotel, Hong Kong. This conference and exhibition promises a comprehensive analysis of mobile planning, policy, technology and commercial opportunities in the Asia Pacific region. Topics covered include technical evolution, network infrastructure, spectrum planning, and PCS terminals and applications development. Fee: $US1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

6-7 **ISDN '93**, Sydney Marriott Hotel. With the imminent launch of Optus' new ISDN service, this technology is undergoing a worldwide resurgence, and is only now beginning to realise its full potential. This event covers ISDN issues and questions, providing a global perspective of ISDN, a look at new ISDN applications, and the benefit of other users' experience. Fee: $1,295. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

6-7 **Mobile Satellite Communications In Asia**, Conrad Hotel, Hong Kong. This event focuses on the commercial opportunities that will continue to develop through the globalisation of communications. There will be keynote speakers from Optus Communications, Indonesia's Satelindo, and Japan's JCSat, as well as addresses by international market leaders in global mobile satellite communications, Inmarsat and Comsat. Other topics will include spectrum, frequency and standards and technical trends. Fee: $US1,495. Enquiries — AIC Conferences Tel: +852 520 1481 Fax: +852 866 7340.

6-10 **TCP/IP Networking**, Sydney. This 3-day seminar and 2-day workshop offers an overview of TCP/IP protocols and products and allows attendees to configure and test a TCP/IP network. Fees: 3-day seminar $1,315; 2-day workshop $1,125; 5-day combined course $2,215. Enquiries — Housley Computer Communications Tel: (02) 499 2666 Fax: (02) 498 7669.

7-9 **Pan-Asian Telecommunications Summit '93**, The Regent, Bangkok. With the Asia telecommunications market expected to exceed $US100 billion over the next five years, this conference aims to give delegates first-hand insights into telecommunications policies, regulation, investment and market opportunities. There will be top level regional and international experts on regulation and planning, and case studies which cover a wide range of experiences in regional telecommunications development. Fee: $US1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

January 1994

16-20 **16th Annual Pacific Telecommunications Conference**, Sheraton Waikiki Hotel, Hawaii. This year's conference has the theme 'Forging New Links,' and looks at the developing economies of Asia, Oceania and the Americas. The issues of technology transfer, education, commerce, information services, human resource development, restructuring and trade will all be covered, as will the future impact of new technologies. The event will attract around 1,100 delegates from over 40 countries, as well as top personnel from carriers, suppliers, government and international organisations. Enquiries — PTC Tel: +1 808 941 3789 Fax: +1 808 944 4874.

February 1994

21-22 **Cabling '94**, Hotel Inter-Continental, Sydney. This conference helps delegates make the right choice when installing and relocating cabling, to ensure their organisation has a solution which encompasses flexibility, durability and efficiency. An optional third day offers a half-day conference and workshop on fibre optics. Fee: Two-day conference $1,395; conference and fibre optics workshop $1,895; fibre optics workshop only $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

March 1994

10-13 **Telemex '94 and Elec-com '94**, Putra World Trade Centre, Kuala Lumpur. The Telemex '94 exhibition will display state-of-the-art business automation and telecommunication systems, while the Elec-com '94 exhibition is targeted at the rapidly growing market of electronics and computer users, and will feature the latest products in these fields. Enquiries — Excel Exhibitions Tel: +60 3 244 0669 Fax: +60 3 244 0670

April 1994

25-29 **Africa Telecom**, Cairo International Conference Centre, Cairo. The theme for this year's conference is 'Integrating Africa Regionally and Globally,' and the event will cover telecommunications financing and investment in Africa, regional tariff structures, infrastructure development and broadcasting and technologies for remote areas. Fee: SFR1500. Enquiries — ITU Africa Telecom 94 Forum +41 22 730 5811 Fax: +41 22 730 6444.

Frame Relay —The Australia/New Zealand Chapter Update

The Australia/New Zealand chapter of the Frame Relay Forum has been growing steadily throughout 1993. Currently, there are 29 local companies who participate in chapter activities; of these, 11 are local members and the remaining companies are currently evaluating membership proposals. In addition, we have representatives from 25 worldwide member organisations who have regular involvement in local chapter events. We also have very active Special Interest Groups (SIGs) running in Victoria and New Zealand. Over fifty companies participate in the monthly meeting of the Victorian SIG and approximately thirty companies have registered interest in the New Zealand SIG meetings.

Chapter Activities

This year the chapter has provided speakers and information stands at 10 major technology events in the region, including the ATUG'93 conference and exhibition held in Sydney earlier this year. At this event, Forum member companies provided Frame Relay Forum information on their stands along with personnel to discuss both the technology and the activities of the Forum.

We were pleased to have Alan Taffel, the Forum President, Worldwide, visit during the ATUG conference to present the Forum paper on Frame Relay applications for one of the main conference streams. Approximately 300 people attended the conference session and Alan's presentation was very well received.

The chapter also conducted a very successful Frame Relay workshop in conjunction with IIR conferences in Sydney in March. The workshop focused on frame relay applications with each session being led by Forum personnel. Over 30 companies participated in the workshop, with the majority being potential users.

User Education

The local chapter has achieved another major milestone this year with the consolidation of an agreement to work closely with ATUG with the prime objective of jointly developing a strong user-focused education program addressing the many aspects of frame relay. This program provides the Forum with a regular speaking slot at ATUG's NSW Branch LAN-WAN Technology Forum meetings held on the first Thursday of each month.

In addition to regular editorial pieces in the ATUG section of *Australian Communications*, Frame Relay Forum articles also appear in ATUG's newsletter 'Newsbrief' whenever possible. We see this relationship as extremely valuable to the development of Frame Relay in this region. The highly successful Frame Relay Education Seminar was held in Sydney on September 29, 1993, together with a demonstration of frame relay LAN interconnect and voice communications over frame relay.

In New Zealand, the chapter participates in local events, including seminar sessions at key regional events such as the recent New Zealand TUANZ (Telecommunications Users Association of New Zealand) conference.

New Applications

During the last six months, we have seen the implementation of many new frame relay networks in the region. At a recent frame relay conference in New Zealand, several prominent companies presented their experiences with frame relay implementations.

For example, the IT manager of Ernst & Young, Charles Fraser, presented a case study. He explained how representatives from Ernst & Young, Telecom New Zealand and Netway set up a testing team to assess the relative merits of three networking options — X.25, DDS and Frame Relay for the implementation of their new Practice Management System. The system is based on distributed database architecture running Ingres W4GL object oriented graphical language to 10 major sites throughout New Zealand.

For this application, the team found that frame relay had clear advantages over X.25 packet switching in speed and affordability because 'large chunks of data could be transferred across the country in economical bursts.' The implementation of Ernst & Young's network was "completely straightforward, with few or no problems," according to Fraser. He said "We have every expectation that the system will gradually expand to a state much larger than it is today. The frame relay service provides the bursty data rates we need to ensure relatively fast file transfers, without incurring the expenses of maintaining a large bandwidth network."

Future Activities

The focus of the Australia/New Zealand chapter for the next six months is expanding our user education and involvement programs. The local chapter is currently planning the Annual General Meeting, details of which will be advised soon. We are looking forward to an interesting and challenging six months with the promise of more frame relay service networks being deployed in the region in the near future.

Also, a brief reminder to all interested parties that the Forum provides free in-house seminars to all companies interested in the potential of frame relay in their networks. Contact Francesca Dolly at the Forum on (02) 975 2582 for further information.

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South Melbourne, VIC, 3205
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Tel: (03) 690 6395
Fax: (03) 699 9094

Authority and Delegation of the TIO

The draft Operations Policy Manual states that the TIO has no authority over the legislature or judicial system, but is empowered to receive, investigate and facilitate the resolution of complaints pertaining to the provision or supply of telecommunications services. In particular, the TIO may hear complaints as to:

- Basic carriage services;
- Higher level services;
- Eligible services;
- Public mobile telecommunications services and public access cordless operator services;
- Directory assistance;
- Fault reporting and repair and maintenance services;
- Printed and electronic White Pages;
- Billing not in accordance with the contracted price;
- Billing for a higher level service in accordance with a tariff; and
- Interference with the privacy of an individual in breach of the *Privacy Act 1988* or specific privacy standards.

The TIO's jurisdiction also includes complaints from owners or occupiers as to:

- Failure by a carrier to give notice of its intention to exercise its statutory rights;
- Failure to take all reasonable steps to cause as little detriment, inconvenience and damage as could be considered reasonably practicable; and
- Inadequate compensation.

However, the areas of complaints not covered by the TIO are as follows:

- The provision or supply of customer premises equipment, other than non-switching handsets terminating standard telephone services and other network terminating equipment supplied as part of a tariffed service;
- Cabling beyond the network termination point, other than cabling from the network termination point to the first telephone, and in the case of residential telecommunications services, to other standard telephone services within the residential premises;
- Business directories including Yellow Pages;
- Commercial activities which do not include the provision of telecommunications services;
- The setting of tariffs;
- The 000 emergency service;
- Universal Service Obligation policy matters;
- Matters of telecommunications policy;
- Matters of anti-competitive behaviour or practices potentially in breach of the *Trade Practices Act 1974*; and
- Complaints specifically under consideration or previously considered by Austel, the Trade Practices Commission or any court or tribunal.

Complaints Management

After investigating a complaint and in the absence of a conciliated settlement of that complaint, the TIO has authority to either dismiss the complaint, or resolve the complaint by making specific determinations or providing specific directions in relation to that complaint which in total do not exceed a value of $10,000. The complainant may elect whether or not to accept the decision within 21 days of the decision being made, or pursue remedies in another forum. In the latter case, the complainant is fully released from the TIO's decision.

After completion of an investigation and in the absence of a conciliated settlement of the complaint, the TIO may also make recommendations to a participant in relation to any or all of the determinations or directions made, up to a total of $50,000.

Where a complaint involves a total amount in excess of $50,000, the TIO is authorised to make findings of fact, but cannot made determinations, directions or recommendations about compensation or other remedial actions.

Finally, where a complaint involves a total amount in excess of $50,000, upon agreement between the complainant and the participant, the TIO has the authority to exercise arbitration powers in relation to the complainant, if the TIO so agrees.

ATUG '94

'Smart Communications for Smart Business'

Royal Exhibition Buildings, Melbourne

2 - 5 May 1994

Reminder

The existing standard for the alpha-numeric key pad (TS 002) is under review and will phase out in April 1996. Will it become this?

1 (BLANK)	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ

ATUG IN SOUTH AUSTRALIA

ATUG members in South Australia should take advantage of the guest speaker presentations organised on a monthly basis by the South Australian Committee. The meetings are held on the third Friday of each month from 4:30pm to 6:00pm. For further information, contact ATUG State Secretary, Peter Hamilton, on (08) 344 6743.

number of complaints handled by the TIO, because more substantial claims would go to litigation, a 'low' limit is a relative term, and in ATUG's view, $20,000 is a relatively low limit.

In the case of the Yellow Pages directory, it is evident that without the business directories there can be no sensible viability of the telephone service to support commerce. According to the Minister for Transport and Communications, Senator Collins, the Government is not convinced that the TIO is the most appropriate avenue of resolution for Yellow Pages disputes.

This is because business directories do not fall within the definition of 'telecommunications services' under the *Telecommunications Act 1991*. At present, the Government feels that such directories are better described as 'providing an advertising service' and would appropriately be regulated as part of the advertising industry.

The lack of a suitable mechanism for telephone directories complaints is unacceptable to ATUG and we have taken this matter further with the Minister so a proper complaints mechanism can be established.

In the meantime, users are advised to ensure that they have a contact name whenever placing an advertisement in a business telephone directory; that they are provided with a proof copy of the advertisement prior to placement; that they ensure the details of the advertisement are correct such as telephone number and business name, spelling etc; and that the method of payment is checked.

Finally, users should not rush into placing an advertisement because any mistake that occurs could cause serious damage to their business.

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1993 INTERDATA HANDBOOK NOW AVAILABLE!

ATUG has sponsored the third edition of the Interdata Telecommunications Handbook, published by IDP Interdata Pty Ltd. This easy reference guide to the telecommunications industry is offered to ATUG members at the discount price of $50, which includes postage and handling. To order, telephone ATUG on (02) 957 1333 or fax your order to (02) 925 0880.

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INTERCEPTION & RECORDING?

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The publication, on a floppy disk, is available to ATUG members at the special price of $150 including postage and packaging — a saving of $50. A subscription including a further two updates is also available to members for $295 — a saving of $100.

To ensure that you have the legislation at your finger tips at all times, take advantage of this special offer. Contact the ATUG secretariat for details of how to order. Telephone (02) 957 1333.

TIO — A Complaints Mechanism

The recent appointment of the former Opposition spokesman on communications, Mr Warwick Smith, as the industry's first Telecommunications Industry Ombudsman (TIO) heralds another new development in the liberalised telecommunications marketplace. This means that users are now able to make their serious complaints regarding any telecommunications service to an independent body other than the Commonwealth Ombudsman.

In the past, users could only take their complaints to the carriers directly, and if the results remained unsatisfactory, the industry regulator, Austel, or the Commonwealth Ombudsman was the next place where problems could be aired. In fact, this was one of the reasons why ATUG was established. By having a united users' voice, individual business users did not have to challenge Telecom on their own.

Today, ATUG boasts membership of more than 650, which includes 100 of the top 500 companies as well as various government departments, small business and individual telecommunications users.

Some of the complaints heard by ATUG from users regarding telecommunications services have included incidents of 'funny' calls showing up on telephone bills, phantom facsimile numbers, silent telephone calls, jammed telephone lines and symptoms of hacking.

Users are always advised to make a formal written complaint to the carrier with as much background information as possible regarding the suspect calls. If the carrier failed to offer a satisfactory solution, then users are advised to take their complaints further. In the case of telephone account errors, users are advised to come to an arrangement with the carrier to pay the telephone bill, less the cost of the calls in question.

In this way, any outstanding amount can be paid at a later date, pending the outcome of the carrier's investigation into the matter.

ATUG's Role

The creation of a TIO scheme was a requirement of the *Telecommunications Act 1991*, and so ATUG's role became one of ensuring the independence of the scheme and that its jurisdiction over complaints was satisfactory to users.

ATUG took part in the consultation process held by the carriers on this subject, and while we were very pleased at their obvious determination that the TIO scheme would be independent, we did make a submission to them expressing our concerns.

In the final proposal, however, we still noted two areas of great concern for telecommunications users. These were the omission of Yellow Pages from the TIO's jurisdiction, and the setting of compensation limits of from $10,000 to $50,000. The lower limit is that which the TIO can demand the carriers must pay in compensation, while the upper limit is recommended, but not binding, on the carriers.

Noting the carriers' reasons for keeping the respective $10,000 and $50,000 limits low, ATUG continues to feel strongly that the limits should be at least $20,000 and $100,000. While one accepts that keeping the limits low has the potential to reduce the

ATUG Network Management Survey

Many members are eagerly awaiting the results of the major survey on network management issues conducted recently on behalf of ATUG. Indeed, we are grateful to the many members who provided an input to the process as sponsors, respondents or the provision of supplier input. The report is now available for purchase. The complete report, including quantitative data runs to over 40 pages, together with well over 60 pages of supporting information and suppliers' responses. The report is available at a cost, including postage and handling, of: $125 to ATUG members; and $200 to non-members. For copies of either the complete report or a copy of the Executive Summary, please complete the form below.

Please forward _____ (qty) copies of the ATUG Network Management Survey at $125 for each copy ($200 non-members) for which I enclose payment of: $_____

Please tick payment method (DO NOT send cash):

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Tel: . . . . . .

Fax: . . . . . .

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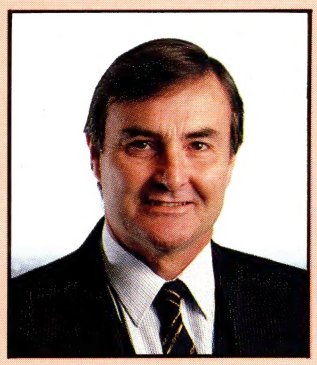


From the desk of the Executive Director

New Monopolism Not for Australia

Wally Rothwell

In a recent edition of his *Telecommunications Management and Marketing* newsletter, Paul Budde editorialised about a term used in the United States called 'New Monopolism.'

This term referred to the fact that, with divestiture of the then ultimate monopolist AT&T, the result was competition in long distance service, but with that came the birth of a new group of monopolists, the Regional Bell Operating Companies, which were given local call monopolies in their area.

Of course, here in Australia, Telecom retains a virtual monopoly over the local loop, although there is nothing preventing Optus or any service provider offering local call service, except the cost of doing so.

Paul Budde suggested that we might soon be seeing some new monopolism in the Telemedia industry, with Telecom's on-again off-again plans to jointly venture with the UK-based audiotex (0055 type of service) company Legion. He makes some good points about the dangers to the service providers in that industry if Telecom does not do the right thing and, in general, ATUG supports his stand.

It would be a rare organisation that did not like the concept of having a whole market niche to itself, so that it does not have to direct resources to warding off the competition. But competition in telecommunications is here to stay in Australia, and we are seeing the great benefits it can bring in terms of higher quality of service, greater concentration on customer needs, and lower prices. New monopolism is therefore not a term ATUG would espouse, nor an effect we would like to see. The task, obviously, is for us to adapt to competition and to embrace it as a fact of life by making the most of it.

Adapting to Competition

In a very good paper produced last year by Dr Joseph Kraemer of Deloitte Touche Tohmatsu International, called *The Effects of Competition on Dominant Carriers*, he encourages monopolist carriers to adapt as quickly as possible to competition, indicating that 'the worldwide pattern is for dominant carriers to give away market share, rather than for competitors to take it away.' He goes on to say that 'This outcome is *not* inevitable, since no *well-managed* conventional army should ever lose over the long term to a guerrilla army.'

One suspects that Telecom's CEO Frank Blount is very well aware of many of the points made in the Kraemer paper, as we see him moving the culture in Telecom away from monopolistic bureaucracy to a competitive customer-focused strategy. It is a task that he must complete very quickly if Telecom is to avoid that giving away of market share.

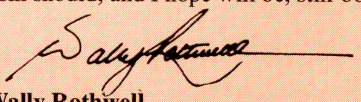
We see that movement particularly in the changing faces of Telecom's senior and middle management and, as one of my closer associates in Telecom told me recently, "If you've been around here for twenty years or more, you'd better have changed the way you operate, or you'll go no further."

There is perhaps one area, though, where new monopoly might be acceptable, although I find it difficult to conceive of it ever happening. Before the 1991 Act, one of ATUG's alternative positions for competition was that there should be a single 'facilities provider,' i.e. one organisation that provides the telecommunications capacity only and that anyone who would wish to provide any service, using that capacity, could do so by leasing the capacity. That service might be anything from PSTN service, to value-added intelligent network service, to broadcasting.

The problem was that, at the time, Telecom provided this capacity and very few people could conceive of Telecom separating out its facilities arm from its services business, especially in the PSTN area. Similarly, Telecom would not have agreed to being a simple facilities provider and selling off all its other businesses, because the future in telecommunication is in the services area — and who would blame them?

As Minister Beddall sets up his Experts Group to discuss broadband services to the home, the possibility again arises as to whether broadband services might be best provided by a single facilities provider company or, at least perhaps, the fibre optics part of that overlaid network.

This is an option that the Experts Group doubtless will look at, even though fibre reticulation is well down the track from both carriers. It is the only area where new monopolism might be viable. But for the other areas of telecommunications, new monopolism should, and I hope will be, still-born.



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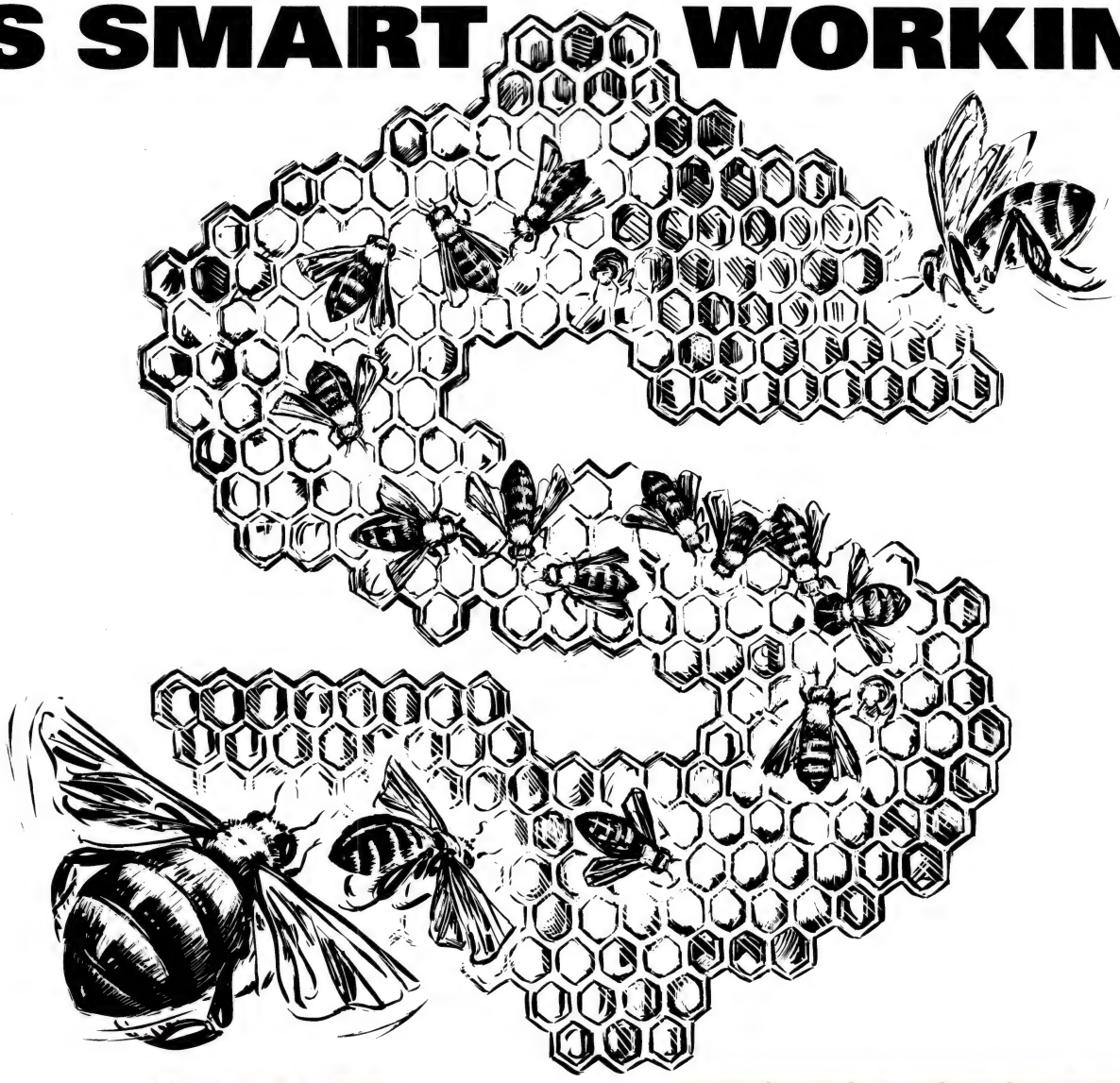

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Organised on behalf of the Australian Telecommunications Users Group. REP/1750

Satellites and the Battle of the Stellar Car Park

One of the most exciting areas of telecoms development in the Asia-Pacific region is the emerging plethora of satellite operators and new international satellite systems. In past articles, we have looked at how this vast expansion of communications satellite capacity will change utterly how the region communicates. But in recent months a 'side issue' of sorts has moved to the forefront. That issue is the nascent crisis over the geostationary orbital 'parking' slots in which these satellites are to be placed.

Simply put, there isn't enough space in space. There are no less than seven major conflicts brewing over communications satellite orbital allocations for the Asia-Pacific region, and several more lesser disputes. According to *Communications Week International*, the leading orbital slots of contention are as follows:

- 100.5E/101E — AsiaSat versus Shinawatra;
- 77.5E/78.5E — AsiaSat versus Shinawatra;
- 168E/167.45E — PanAmSat versus Pacstar;
- 134E — Rimsat versus Palapa;
- 69E/70E — Intelsat versus Rimsat;
- 85E/83.3E — Intelsat versus Rimsat; and
- 91.5E — Intelsat versus Binariang.

As part of an overall effort to get the key players together, PTC is organising a major round table workshop meeting at PTC'94, the 16th Annual Pacific Telecommunications Conference, in Honolulu on 16-20 January 1994. The round table workshop, organised and chaired by Timothy Logue, Space and Telecommunications Analyst for US firm Reid & Priest, will be held on the morning of Sunday 16 January. We hope to discuss some of the issues behind the disputes and work towards solving them.

As this contentious issue has arisen, many have asked about the role of the International Telecommunications Union (ITU). After all, didn't the ITU hold a two-part World Administrative Radio Conference (WARC) in the mid-1980s (ORB-85 and ORB-88) to resolve this once and for all? In fact, the ITU has tracked this issue since the first Sputnik in 1957. However, as with radio frequency spectrum management, the ITU has had no choice but to rely largely on the honour of the member countries . . . and as is the case in spectrum management, honour is a highly relative concept.

"The problem . . . is one of too few orbital slots for too many satellites. If everyone is playing by the rules — and all the players claim that they are — then why is this happening?"

In the early discussions about orbital allocations, the ITU recognised that space limitations made *a priori* (i.e. advance) allocation of orbital parking slots absolutely imperative. The geostationary orbit was too limited and too important to suffer the 'first come, first served' *a posteriori* world of much of the radio spectrum. Likewise, orbital allocations were inherently more international in nature, even if only to the extent that cross-border signal spillover was largely inevitable in services offering 'national' coverage.

Following the 1980s ITU Space WARCs, each country was assigned several orbital slots for domestic use. While the ITU accommodates multi-administration systems like Intelsat, Inmarsat and Intersputnik, these systems have orbital allocations registered through their home country — the US, Britain and Russia respectively — although these organisations provide worldwide services.

The ITU, in an effort to be equitable, assigned a minimum number of slots to *every* country, no matter how small or seemingly inconsequential. Several small countries have taken advantage of this new commercial resource to become 'satellite brokers' for regional services. The most famous example of this, detailed in this column *passim*, is TongaSat. But even AsiaSat (Hong Kong (UK)), and Astra (Luxembourg) work on this basis. Larger countries have also shifted their existing domestic satellite services to an increasing international and regional presence, as we have seen with Indonesia's Palapa or Thailand's Shinawatra.

The problem, as the list of battles above depicts, is one of too few orbital slots for too many satellites. If everyone is playing by the rules — and all the players claim that they are — then why is this happening? And how will it be resolved?

The 'why' is partly explained by the inability of the ITU to enforce orbital allocations, and certain problems with the rules themselves. For example, the ITU's *Space Network List* of 15 June 1993 showed three countries with allocations in the 95 Degree East slot — the US (Intelsat), Russia (CSDRN, still carrying the ITU URS designation), and Malaysia (Measat). At this stage, the actual user of this slot would be whomever gets the satellite in position first. It is entirely possible that a satellite operator could 'jam' operations of another in its desired slot. It is reported that AsiaSat could move Comstar D4 into the 100.5E slot in order to jam the signals of Shinawatra's ThaiCom-1 (*Communications Week International*, 14 June 1993). Irving Goldstein, the Director-General of Intelsat, has warned of this looming 'piracy' in space orbital slots if order cannot be maintained. Star Wars, indeed . . .

As in the area of international technical standards, the likelihood of harmonious accord is inversely proportionate to the stakes. This has been the case with international technical standards, with several segments of the radio frequency spectrum, and now (and somewhat inevitably) with orbital slots. The union could expedite registration procedures and keep a tighter rein on countries registering orbital slots on behalf of entities that may only possess the most nebulous and unlikely plans to launch a satellite. And yet, in some ways, the maverick nature of the orbital slot battle reflects the speed with which much-needed communications satellite services are being provided to an underserved part of the world. Should we advocate any means of stifling that energy and zeal?

Moreover, what exactly can the ITU do? How can ITU regulations be binding? Nominally, ITU conventions and regulations are binding upon those countries adhering to them — that is, most countries. But most countries also place convenient 'reservations' within ITU Final Acts, which tend to read as follows: 'The Delegation of (country) . . . reserves the right to take such action as it may consider necessary to safeguard its interests, should any Member fail in any way to observe the provisions of the Constitution and Convention of the ITU . . . or should the reservations made by other Members jeopardise its telecommunications services . . .'. These reservations leave sizeable loopholes for unilateral action.

We hope that the Round Table Workshop at PTC'94 will at least provide an opportunity for all the interested parties to meet 'on neutral ground.'

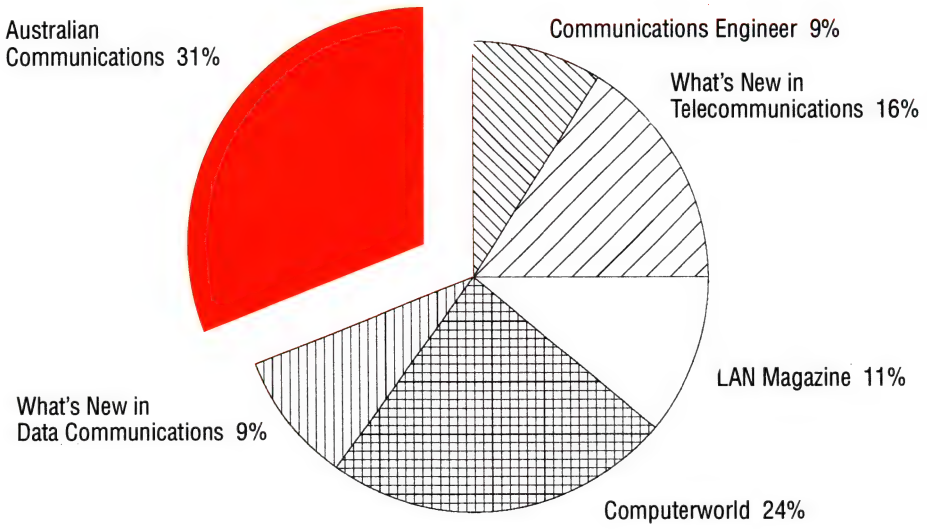
James Savage is the Assistant Director, Pacific Telecommunications Council and Editor of the Pacific Telecommunications Review.

Which publication is read by more communications professionals?

ATUG - The Exhibition and Conference of the Australian Telecommunications Users Group is unquestionably the major communications event in Australia. Visitors to the annual event are widely considered to be the region's top communications professionals, responsible for the lion's share of its networking and telecommunications purchasing.

Upon registering at ATUG'93 visitors were requested to indicate the communications/networking publications they regularly read. Judging from the **4,690*** completed questionnaires *Australian Communications* is clearly the choice of communications professionals

" I regularly read...."



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processor which has built-in automatic flow control, and data integrity is protected because the board eliminates buffer overrun errors.

The product maximises PC performance by providing dual 1,024-byte send/receive buffers and a 16-bit PC bus interface. It is able to work with most high speed modems and ISDN terminal adaptors, is fully compatible with Windows communications software, and comes with drivers for Windows 3.0 and 3.1 and Windows for Workgroups.

Company officials said that although the board is designed for speeds of up to 921.2Kbps, the current Windows driver software would still allow users to attain transmission speeds of up to 115.2Kbps.

The ESP Communications Accelerator 2.0 incorporates Hayes' own Communications Bus Interface Controller (COMbic), which is a single chip coprocessor that replaces the majority of the circuitry used in the previous version of the product. This processor supports serial data rates of up to 921.2Kbps, and an additional special purpose communications co-processor manages the buffer, automatic flow control and system interface.

It provides a single RS-232 serial port via a standard DB-9 connector, and supports COM 1 to COM 4. There are three jumper-selectable Base I/O address options and eight software selectable options. The board provides five selectable IRQs in 8-bit mode, and 10 in 16-bit mode.

The ESP Communications Accelerator is priced at $206, including tax.

MPA International
(03) 724 4444

Lantronix Print Servers

Powercorp has announced the introduction of Universal Print Services for Lantronix Print and Terminal Servers.

Lantronix Universal Print Services provide full printer support for TCP/IP, NetWare, AppleTalk (EtherTalk) and DEC LAT concurrently on every port, allowing users to distribute printers and terminals transparently across an organisation, all supported by common print and terminal services. Four protocols may be in use simultaneously in the same ETS or EPS unit, or the same serial port may be used by multiple hosts using any of the four protocols. Print requests are queued and served in the order received, regardless of the protocol used.

There are six models available, and pricing ranges from $1,226 (excluding tax) for the EPS1 with one parallel and one serial port, up to $3,376 (excluding tax) for the ETS16 with 16 serial ports.

Powercorp (02) 476 3466

Lantronix EPS and ETS units handle four protocols simultaneously

Compaq's ProLiant family of servers come with CD-ROM drives

Management frames to periodically poll stations on the ring. SmartMon also tags each network event with a time stamp and an indication of its source, and events are also logged to an ASCII file for archiving or later examination.

SmartMon reports on more than 40 network events, including the location and timing of ring wrapped conditions, duplicate addresses, undesirable connections and frame error conditions. In addition, SmartMon supports other functions such as real-time ring mapper updates, distribution of traffic by protocol and frame size, traffic history for trend analysis, SMT connection diagnostics and line state monitoring for both primary and secondary rings.

Wandel & Goltermann
(03) 690 6700

New High-End Servers

Compaq has introduced a new family of servers which it says are highly reliable and easy to manage.

The ProLiant range is engineered to provide high levels of I/O and processor performance, and all models include Compaq Full Spectrum Fault Management, hot-pluggable disk drives, CD-ROM drive and NetFlex controller.

The ProLiant 100 is a single-processor file server which is available in models with either a 486DX2/66MHz processor and Flex Architecture, or a Pentium 60MHz processor and TriFlex-/PC architecture. Pricing for a fully-configured system starts at around $13,000 including tax.

The ProLiant 2000 supports two processors and incorporates TriFlex architecture. It offers the same characteristics as the ProLiant 1000, but includes Advanced Error Correction Code memory for improved memory integrity. The system can be configured for one processor, or a second processor can be configured as an off-line backup for the other, or for symmetric multiprocessing. Pricing starts at just under $20,000.

The ProLiant 4000 can use up to four processors for mission-critical network capabilities and symmetrical multiprocessing. It has the same features as the ProLiant 2000, but all drive storage is contained in an external ProLiant Storage System. It sells for around $38,000. Both the ProLiant 2000 and 4000 are available with 486/-50MHz or Pentium 66MHz processors. All ProLiant models are available immediately, except the ProLiant 4000 486/50MHz system, which is expected to be available by the end of the year.

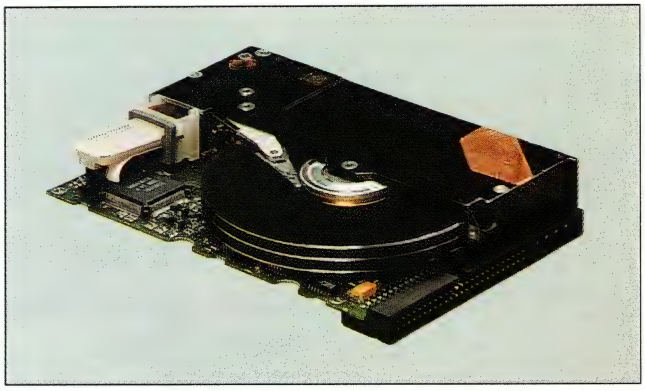
Compaq (02) 911 1999

Communications Accelerator

Hayes Microcomputer Products has announced a single port 16-bit Hayes ESP Communications Accelerator which is capable of supporting data speeds of up to 921.2Kbps.

The Hayes ESP Communications Accelerator version 2.0 is an enhanced serial board for IBM PCs and compatibles that maximises data transmission speeds and prepares the way for high-speed modems or ISDN applications.

The half-card board contains a dedicated communications co-



The Spitfire 0662 offers high storage capacity in a very compact unit

The DSR technology consists of a family of four boards — PC Record card, PC Uplink card, PC Transport card and PC Decoder card — which use the ISO MPEG standard for digital video compression. They also comply with the international CCIR 601 digital video standard for image resolution.

A full range of user-selectable horizontal resolutions is offered including 704, 544, 480 and 352 pixels. Lower resolutions allow VCR-like quality programming to be transmitted over low speed lines.

The DSR system also provides CD-quality audio; 'genlocking' capability which permits smooth transitions in and out of regular programming; SCSI controller for moving data to and from digital devices at high speed; and a wide range of software command functions to let users write customised software for specific applications.

The system is compatible with MPEG-encoded video at data rates ranging from 1Mbps to 8.3Mbps. Full I, B and P frame encoding is also supported.

Scientific-Atlanta
(02) 452 3388

Fastest 1Gb Drive

IBM Adstar has released its new Spitfire family of 1-gigabyte disk drives, and a new range of 2-gigabyte drives.

Officials said the Model 0662 is the first 1Gb drive in a 1-inch high, 3.5-inch form factor. It has a 5.5 megabyte per second sustained transfer rate, and three disks, and offers high data storage capacity in a small package.

The device has a projected mean time between failures of 800,000 hours, and comes with a five year warranty.

The company's new 2Gb 0664 Allicat drives provide 2Gb of direct access storage in a 3.5-inch form factor. The drives provide 5.22 megabyte per second media data rate, with 750,000 hours mean time between failures. For higher performance, a 68-pin (16-bit) option is provided for both drives, with support for 16 SCSI addresses, 16-bit data transfer widths and a 20-Mbps burst SCSI transfer rate.

Both drives feature the newly developed magneto-resistive head, which company officials said allows a more than 50% increase in information storage density over previous products.

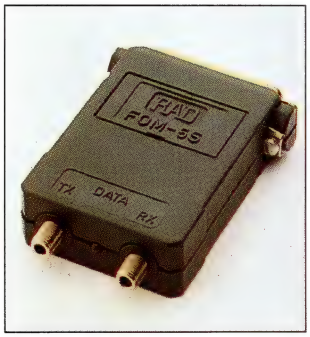
Advance Peripherals
(02) 983 9666

FDDI Analyser

Wandel & Goltermann has announced the FDDI SmartMon application for its DA-30 Internetwork Analyser.

The new application enables network managers to easily pinpoint problems on an FDDI network both during installation and when fully operational. The software notifies users of problems using plain English text, so it is very well-suited to less experienced network troubleshooters. However, officials said the software's intelligent interactive monitoring capabilities extend the utility of the DA-30 for all field engineers.

FDDI's dual ringed structure means many problems do not propagate around the ring, making them invisible to traditional analysers. To counter this problem, the SmartMon software makes use of FDDI's Station



RAD's FOM-5S has a range of 3km over fibre optic cable

Ultra-Mini Fibre Optic Modem

RAD Data Communications has announced its new FOM-5S modem, which provides synchronous transmission over fibre optic cable at speeds of up to 19.2Kbps.

The unit's operational range is up to 3km, regardless of the data rate, according to RAD officials. It measures 75mm by 18mm, and plugs directly into the V.24/RS-232C terminal connector, without the need for AC power.

Offering three clock modes (internal, external and receive loopback), the unit can be used in a wide range of applications, and it also offers ST, SMA or FC-type optical connectors.

Dataplex (03) 210 3333

NetKeeper Network Management Tool

Alloy Computer Products has announced the new NetKeeper Express, which, once installed on a network server, allows network managers to collect information about all the hardware and software installed on the network, according to officials.

The software also generates network configuration reports to allow managers to quickly spot trouble areas, said a spokesperson. It recognises over 3,000 different software applications and versions automatically, with the option to add more manually, and it allows managers to detect unauthorised software, such as games, which can open the network to virus infection.

NetKeeper Express recognises over 3,000 different applications

NetKeeper Express supports all major network operating systems including NetWare, LANtastic, Banyan and Microsoft's LAN Manager.

Alloy has also released NetKeeper Configuration Manager, which allows administrators to inventory or audit all hardware and software on the network, and to create a library of all the files which are necessary for each workstation's proper operation, officials said. These files can then be used to reconfigure existing workstations, add new workstations and decrease the install time for new network systems, they added.

Alloy Computer Products (03) 561 4988

MPEG Storage and Retrieval System

Scientific-Atlanta has developed a new Digital Storage and Retrieval System (DSR) for all MPEG-based compressed video and audio program material.

The PC-based system provides a low-cost way of performing real-time encoding, storage, distribution and playback of MPEG (Moving Picture Experts Group)-based data files. Officials said product applications include digital ad insertion, movie-on-demand, retail kiosks and video education and training. They added that the system can also replace traditional storage methods, where huge volumes of analogue videotapes had to be physically stored, which was both costly and unwieldy.

The cards are able to cost-effectively connect a PC to an IBM AS/400 or System 3X midrange computer, according to company officials.

The IT 8251 can support seven concurrent sessions using a minimum memory of 63K, plus 15K for each active printer session. Sessions can run under Windows in a DOS partition, and users can switch between the active host and PC/DOS sessions using a hot-key. The cards can store up to 10 individual user configurations in memory, ensuring each user has hassle-free log-on, said officials.

The cards provide printer emulation support for a wide range of industry standards including IBM 4214, 5225, 5224, 5256, 5219, 3812 (COR), HP, ProPrinter and Epson, and the Fargo/Zebra label printer. Five printer sessions can run simultaneously, using either serial or parallel printers, said officials.

The IT 8521 is fully compatible with the IBM Rumba graphical user interface, and will run up to 32 sessions on one computer, with automatic sizing of text for true WYSIWYG presentation, say officials.

Officials said the cards feature fast file transfer speeds, and support many file transfer programs including FSC, FTF, PC Support/400, PC Support/3X as well as ETU. They are compatible with a range of IBM terminals including 132 column and 32 character attribute support.

The IT 8251 version 'E' for AT bus PCs sells for $495, and the 'ME' model for MicroChannel bus PCs sells for $575. Both prices include tax, and the cards come with a three year warranty.

Intelligent Technologies
(02) 891 6010

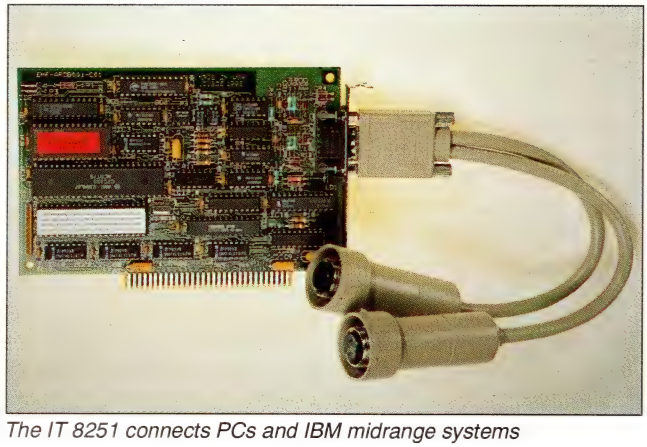
Call Cost Analysis

Oscom has released a PC program that allows users to compare the cost of using Telecom or Optus, and check the accuracy of their telephone bills. The new Timecost software can give an accurate cost comparison of a single call or accumulated calls using the Telecom PSTN, Telecom ISDN and Optus networks, said officials from the company.

The program costs calls as they are made, provides a means of checking the accuracy of telephone accounts, and has a provision to allow users to modify the Tariff Tables when the carriers change their billing rates. It can also display the distance between the calling party and destination, and comes with a database that calculates calls from one location and covers all calls originating from that location to any other place. Companies with several different locations can purchase additional copies of the package with other location databases at reduced cost, said officials.

The Timecost package sells for $59.

Oscom (02) 419 6276



The IT 8251 connects PCs and IBM midrange systems

Cray's S/NAPs connect IBM host systems to LANs

of RAM, 16Mb of non-volatile memory, and 6Gb of usable disk space.

Unixpac (02) 953 8366

ScaNet Network Access Processors

Cray Communications has introduced a new range of ScaNet/Network Access Processors (S/NAP) for connection of IBM SNA and AS/400 hosts to ScaNet LAN/WAN systems. The ScaNet S/NAPs use a high speed hardware platform based on RISC processors, which enables the loading of several simultaneous communication and management protocols. The S/NAPs handle terminal and printer sessions using OSI, TCP/IP and DEC LAT protocols.

The S/NAP can make different vendor equipment appear as IBM terminals to the host. The S/NAP translates between SNA and OSI TP4, TCP/IP or DEC LAT protocols, as well as between the 3270 data stream and the ASCII or EBCDIC character set. Telnet 3270 support for direct communications with IBM SNA hosts via TCP/IP will also be available, said officials.

The S/NAP for SNA appears to the host as an IBM 3x74 cluster controller.

For SDLC communications between the host and the S/NAP, a range of interface boards is available including X.25/V.24 for Packet Switched Data Networks up to 64Kbps, X.21 for Circuit Switched Data Networks up to 64Kbps, and V.24 or high speed V.35/V.35 up to 230Kbps on leased lines. A Token Ring interface board up to 16Mbps is also available, allowing an IBM host connected to a Token Ring network to exchange data with stations on ScaNet Ethernet across the Token Ring.

A Cray spokesperson claimed the S/NAPs are well suited to incorporation into LANs using multiple protocols, and are also ideal as a tool for migration between protocols.

For example, asynchronous, coax or twinax printers can be shared both by IBM host applications and by other stations on the network, with handling of printer sessions using OSI TP4, TCP/IP and LAT.

ScaNet S/NAPs can also be managed from ScaNet Network Management systems as well as IBM NetView and SNMP-compatible systems such as OpenView. The S/NAP for SNA also contains a special monitor for diagnostics and tracing, both in the SNA and OSI environment.

Cray Communications
(02) 451 6655

New Pricing for IBM 5250 Emulation Cards

Intelligent Technologies has announced a new low price for the IT 8251 series of IBM 5250 emulation cards.

QPSX Cell Switch Upgrade

QPSX has announced an upgrade to its Cell Switch product, which will enable it to support larger networks, and offer more flexible addressing and more interfaces.

Networks based on the cell switch operate as local and wide area high performance LANs with voice capability. The initial release of the QPSX cell switch supported direct LAN and PABX connection. The new release extends support for SMDS and CBDS connection capabilities, providing standard access at 34Mbps and 45Mbps into long distance core networks already operating over PDH or SDH/SONET transmission at up to 155Mbps.

Existing networks offering frame relay service across a QPSX-equipped network can now also be upgraded with a new, more capable and cost-effective interface, said QPSX officials.

More flexible assignment of the standard public 60-bit E.164 addresses and interworking between networks will improve the ability to extend QPSX-based networks across administrative and international boundaries, the officials said.

For corporate and campus networks, the intelligent distributed switch equipment can now be managed using simplified management, which, combined with existing 1.5 and 2Mbps interfaces, enables the creation of high capability voice/data backbones. Company officials said this release foreshadows the availability of a future interface to ATM bearer service equipment being defined by the ATM Forum.

The QPSX technology and IEEE 802.6 standard incorporate several transfer modes. The connectionless data mode directly supports long distance cell transport of LAN and computer packet data. A different mode provides for low delay transport of voice and video. A connection-oriented mode, which is similar to the approach adopted by the ATM Forum, is also included.

Company officials said the ATM bearer services to be supported by the ATM Forum vendors, and the emerging CCITT standard for Broadband ISDN, use cell-based technology but are connection oriented. End to end bandwidth negotiation and route establishment is required before transfer of information.

The QPSX ATM interface will provide the conversion between existing connectionless computer and local area network protocols, and the connections needed to transit equipment supporting the ATM UNI. It will also provide for the addresses carried by each packet of data to be translated into the ATM VPI/VCI identifiers.

QPSX Communications (09) 262 2000

and graphics found in the original document.

The package consists of two parts — the Replica Creator, and the Replica Viewer. The Replica Creator lets users easily create a document from any Windows or Macintosh application that is able to produce printed output. By selecting the Replica Creator printer driver and using the print command, an electronic facsimile of the document is created, with Creator capturing and compressing the document.

Users can optimise compression for the smallest possible file size, and the created document can be distributed to other users through direct links to packages such as cc:Mail and Microsoft Mail.

Replica Viewer, which runs on a 286-based computer with Windows 3.1, or a Macintosh System 7, lets users view, print, copy and paste information.

There is also the option to automatically include Viewer in a Replica file to generate 'self-launching' Replica documents which can be viewed by recipients who do not have Replica installed.

The Replica cross-platform file format is a superset of TrueType, GDI and QuickDraw native languages, and enables the storage of all formatting information to ensure that the appearance of the shared document is exactly the same as the original. The package also features security options such as password control over who is able to open a document, and the ability to prevent recipients from copying file contents to the clipboard.

Replica for Windows and Replica for Macintosh sell for $199, or are available in packs of 10 at a cost of $1,399.

NetComm (02) 888 5533

E1 Line Termination Unit

RAD Data Communications has recently released its new LTU-2 E1 (2.048Mbps) line termination unit. The unit is used to connect user premises equipment such as PABXs and multiplexers to the E1 public network over distances of up to 2.2km.

Officials said the LTU-2 can also be used to supply power to G.703 repeaters, and, operating in conjunction with these repeaters, can extend E1 connections up to 20km.

The unit complies with CCITT G.703, features surge and line protection circuitry, and can support up to 45dB of attenuation at 1024Kbps.

Diagnostic capabilities comply with CCITT V.54, and include analogue loopback and remote digital loopback, as well as built-in BER testing. Officials said it supports up to 45dB of attenuation at 1,024bps.

The LTU-2 is available as a desktop unit or as a card for installation in an ASM-MN-114 19-inch Card Nest.

Dataplex (03) 210 3333

The FAServer has a RAID subsystem for secure data storage

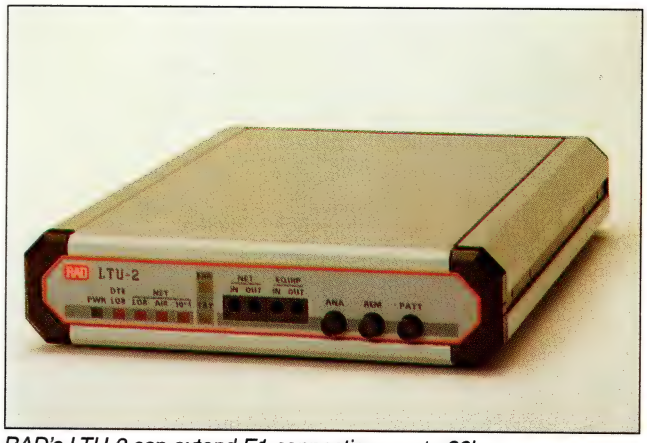
NFS File Server

Unixpac has released an inexpensive and fast NFS file server called the FAServer.

The new product, which is made by Network Alliance Corporation, consists of an Intel 486 processor in an EISA bus chassis, with an added 16Mb of main memory, 2Mb of non-volatile memory, and a RAID subsystem for fast and reliable data storage, a company spokesperson said.

The FAServer uses FASware software, and includes a utility called Snapshot, which holds 20 logical copies of the entire file system in the RAID disk array, allowing users to recover corrupted or deleted files without using tape backups, or to make a tape backup while the file service is online.

FAServer comes with one Ethernet port, two 1.08-gigabyte hard disk drives with FASware installed, and a console and keyboard, and costs $29,995. The server is expandable to 128Mb



RAD's LTU-2 can extend E1 connections up to 20km

Novell Remote Access Platform

Novell has announced NetWare Connect, a remote communications platform that supports mobile and network users for both inbound and outbound communications. NetWare Connect is built on and integrated with NetWare, and consolidates core communications resources on a single integrated and scalable platform, said Novell officials.

NetWare Connect is a NetWare Loadable Module that supports mobile users with remote node and remote control capabilities for accessing data, applications and services, exchanging electronic mail and performing other network activities. Users can also use a number of remote control packages to dial-in through NetWare Connect and access their desktop systems on the network, or access an applications server. At the same time, NetWare Connect supports dialling out capabilities for network users to access bulletin boards or remote host systems.

Using NetWare Connect, remote node, remote control and dial-out users share modems and communications lines such as asynchronous, X.25 or ISDN, which eliminates the need for multiple communication servers and dedicated desktop modems and phone lines. The software also provides a single point of remote connectivity for network services such as software distribution, e-mail and fax.

NetWare Connect has extensive security features to control access to each line and port on the server for inbound as well as outbound connections. NetWare Connect can work with any combination of modems, and provides SNMP alerts to SNMP-compatible products.

NetWare Connect is available in 2-, 8- and 32-port configurations that can be added together to scale a user's installation. It can be installed on NetWare 3.x or 4.x and can run on an existing NetWare server with other NetWare services and applications, or on a dedicated server running NetWare Runtime. Pricing is $1,140 for a 2-port version, $4,190 for an 8-port version, and $11,440 for a 32-port version.

Novell (02) 413 3077

for Token Ring and FDDI, and graphing and pie charts for the display of specific Token Ring status.

Chipcom (02) 416 0653

New SmartModem

NetComm has announced the new SmartModem E7F, which supersedes the company's SmartModem E7 and, with a new price tag of $1,099, also offers a price reduction of $200.

The SmartModem E7F now has 14.4Kbps facsimile capabilities, and incorporates powerful 16-bit technology to achieve a data throughput rate of up to 57,600bps.

The 16-bit Motorola processor and miniaturised components from NetComm's surface mount technology has enabled the company to add more features to the SmartModem while maintaining its size, company officials said. New features include the combination of V.42 error correction and V.42*bis* data compression. V.42*bis* compression allows the new modem to achieve its very high 57.6Kbps throughput while maintaining data integrity, said officials.

NetComm (02) 888 5533

Portable Multicore-Cable Tester

Rutherford Electrical Engineering Services has introduced a portable processor-controlled insulation and continuity tester for electrical cables.

The product, known as the MCCT1, was developed by the UK-based Cleveland Test Equipment Company, and includes data storage and printout facilities. Used to test multiconductor cables, it is capable of testing a large number of cores, and the screen and armour for insulation integrity, and then measure the resistance of each in just a few minutes, according to company officials.

Additional facilities include the ability to conduct ground-loop resistance tests and installed-cable length estimation. The unit is compact, and incorporates a large screen which displays instructions in plain English, or in any pre-programmed language, and prompts users with a choice of options from a menu. Results are printed on a test sheet, and the MCCT1 can also communicate with site computers for the loading of test and certification data directly from the cable schedule.

Rutherford Electrical Engineering Services (049) 327 200

X.25 Upgrade

Australian Unix developer Stallion Technologies has released a major upgrade to its range of X.25 wide area network communication products.

The upgrade includes Unix SVR4.0 and SVR4.2 (including UnixWare) support for Stallion's Xtend-25 and Xtend-Router packages.

Xtend-25 is an enhanced run-time package that provides X.25 services for Unix users, including a standard STREAMS-based Application Programming Interface, support for PAD services, fast file transfer and support for all Unix utilities, said officials. As well as SVR4 support, Xtend-25 now offers support for up to 128 virtual circuits per card, and better performance in the transmission of X.25 data packets.

Xtend-Router, in conjunction with Xtend-25, enables X.25 switched virtual circuits to carry TCP/IP packets, and provides a link to multiple geographically dispersed TCP/IP LANs. The company said this is the first full commercial release of this product, which is compatible with all other equipment conforming to the RFC877 spec.

Stallion has also added Micro-Channel and EISA bus support for its ONboard-Sync range of X.25 co-processors, and has released a new X.25 co-processor, called the Xtream II.

The Xtream II offers two high-speed synchronous links at data speeds of up to 64Kbps each, and provides the option of V.24, V.35 or V.36 interfaces.

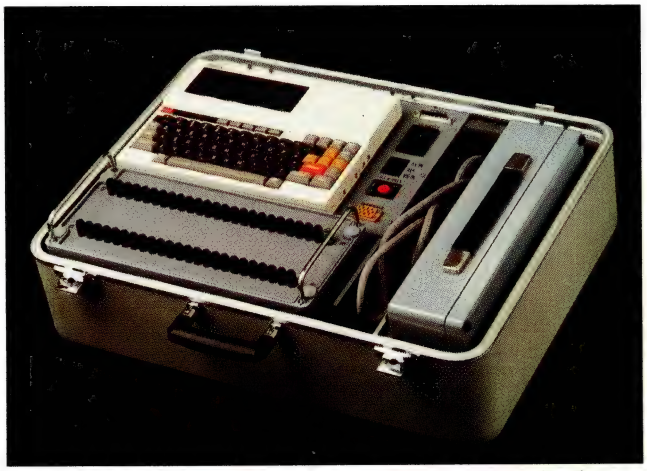
Stallion Technologies (07) 870 4999

Portable Document Software

NetComm has announced the release of Farallon Computing's Replica software for networked Windows and Macintosh environments.

Replica allows users to share any document, regardless of application, font, graphics or platform, eliminating problems of incompatibility and saving the cost involved in buying multiple applications for multiple computers, according to company officials.

A single copy of Replica enables a user to create files from any application, while retaining all the formatting features, fonts



Cleveland's MCCT1 tests cables for insulation integrity and resistance

New Token Ring Product Family

Kingston Technology has recently released a new range of IBM-compatible Token Ring network products for users of MicroChannel systems.

The new line, which is called TokenRX, includes a Dual Interface Adaptor Card featuring the IBM/National Semiconductor Token Ring Protocol Interface Controller (TROPIC) chipset, as well as two Multistation Access Units (MAUs).

The Dual Interface Adaptor Card has both a DB-9 shielded twisted pair and an RJ-45 unshielded twisted pair interface to provide multiple access capability. The TokenRX Network Adaptor Card is completely compatible with IBM Adaptor Drivers and supports a wide range of network operating systems, including Novell NetWare, NetWare Lite, Microsoft LAN Manager, IBM OS/2 EE, LAN Server, and Banyan VINES, said officials from the company.

The new range also offers two versions of the 8-port Multiple Access Unit, which allows users to choose either a shielded twisted pair MAU utilising DB-9 connectors, or an unshielded twisted pair MAU with RJ-45 interfaces. Both UTP and STP versions include Ring-in and Ring-out trunk ports.

The TokenRX Dual Interface Adaptor Card sells for $808. The unshielded twisted pair version of the MAU is priced at $840, while the shielded twisted pair version sells for $905.

Kingston Technology
(03) 690 9699

Network Management Software

Chipcom has recently released a new version of its ONdemand Network Control System (NCS) software, which includes first-time support for HP's OpenView and DEC's Polycenter network management platforms.

ONdemand 2.0 is a graphical application package for managing a range of Chipcom network devices. It provides visual point-and click control of all ONline system concentrators, modules, ports, bridges and network routers via a central network management station.

Officials said the new software has added support for ONline Token Ring modules, including Bridge and Management modules, to its existing support for Ethernet Bridge and FDDI Management modules.

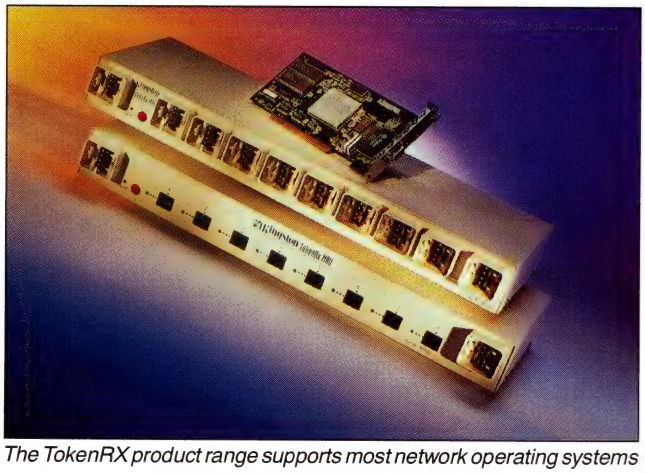
ONdemand NCS 2.0 is able to collect information and manage 'logical' networks and workgroups regardless of where they reside in an organisation. Using the new Port Database feature, network administrators can identify an endstation, concentrator, port characteristics, IP and MAC addresses and cable type for any user.

The new Port Grouping feature for ONline Token Ring and Ethernet modules allows administrators to add, remove, enable and disable ports within a module, saving time on routing maintenance operations on multiple ports, said officials.

ONdemand NCS 2.0 represents all ONline components as graphical icons, and users can immediately determine the status of each port in every module in a concentrator. The software also provides a new Auto Discovery mechanism which automatically detects all Chipcom hubs and management agents.

ONdemand 2.0 also allows net managers to add, move, and change users electronically, so users can be reassigned among networks to balance loads.

Other new features include a robust set of graphical management tools and a range of new diagnostic tools, such as a connectivity test tool, station maps



The TokenRX product range supports most network operating systems

Olicom Releases Ethernet Product Range

Danish firm Olicom, which is already well-established in the Token Ring market, has just announced the release of its first range of Ethernet products, called EtherCom. Officials said the release is the first step in a complete Ethernet product range which will include adaptors, intelligent wiring components and internetworking products. The initial release includes the EtherCom ISA adaptor; the EtherCom ISA Fibre adaptor; the EtherCom MCA adaptor; the EtherCom EISA 32 adaptor; the EtherCom Hub; and the EtherCom SNMP Hub.

The EtherCom ISA adaptors are standard Novell NE2000-compatible cards with an option for Shared Memory mode, using Olicom's own dedicated drivers for all major network operating systems. The adaptors are available in three different models: BNC/AUI connectors; RJ-45/AUI connectors; or a combination model with both RJ-45/BNC/AUI connectors. All cards are switchless and entirely configurable via software.

The EtherCom ISA Fibre adaptor features parallel tasking technology with a fibre front-end compliant with the IEEE 10Base-F standard. The 16/32 bit EtherCom MCA adaptors are all built around a processor with dramatically reduced design, which according to officials maximises performance, reduces cost and increases reliability. They also feature 256K flash memory, which makes installation easier and provides remote program load to NetWare or LAN Manager networks.

The EtherCom EISA 32 adaptor is a high-performance 32-bit busmaster adaptor designed for use in high end workstations and servers. It incorporates the new Intel 82596 Ethernet co-processor, 256K flash memory, automated EISA configuration and automatic wiring detection.

All EtherCom products feature SNMP Desktop Agent to support full desktop management. It provides drivers for DOS/Windows and OS/2, and implements a standard SNMP agent including MIB II and relevant parts of Hosts Resources MIB.

The EtherCom Hub is an unmanaged stackable hub which is cascade connectable and provides up to 16 10Base-T connections. The backbone connection is field-selectable between AUI, BNC, STP, UTP and fibre using a plug-in Media Interface Module. The hub can be externally connected to another EtherCom Hub to form a single logical unmanaged repeater, or to an EtherCom SNMP Hub to form a single logical SNMP managed repeater. Up to four units can be cascade connected, and only one SNMP managed hub is needed to manage all units.

The EtherCom SNMP Hub includes the standard features of the EtherCom Hub, and adds full SNMP management including MIB II, RFC repeater MIB and Olicom-specific MIBs. The SNMP implementation operates over TCP/IP or IPX, and there is an in-band Telnet facility for configuration and troubleshooting, as well as an out-of-band connection providing dial-in or dial-out facilities. The EtherCom SNMP Hub also features a numeric two-segment display to aid in troubleshooting.

The full EtherCom product range supports NetWare, Microsoft LAN Manager, Windows for Workgroups, Windows NT and IBM LAN, and host communication products such as the IBM OS/2 Extended Services and LAN Server.

Force Technology (02) 971 1000

case (see 'Booz, Allen Builds a Frame Relay Network' on page 106) these were mainly 56Kbps and 9.6Kbps rates. Thus, to interconnect two sites incurs two of each charge, which would normally be higher than one leased line charge. Each additional site requires only one more access charge and one more CIR charge, and this is normally much cheaper than adding another dedicated line for each site. Thus, as the network grows in locations being served, the savings grow. The savings in sharing lines and thus running multiple higher level protocols also applies to IP and X.25 networks. The second saving offered by frame relay however is in switch cost.

Today's frame relay switches use PVCs to switch traffic so no call set-up processing as in X.25 or routing processing as in IP is required. There is also no flow control or error recovery as in LAP.B in X.25 or PPP in TCP/IP. The effect of this is that a frame relay switch can handle a higher throughput measured in frames or bits processed per second than alternative X.25 switches or IP routers of the same cost. Q-Net selected frame relay simply because it could move more bits per second when using frame relay rather than when using X.25. This hardware saving is measured as establishment cost in private networks.

The third area for saving and benefits is to combine voice and video on the same bandwidth as the data. This is normally done by compressing the digitised voice to 32Kbps or lower, or the video to 128Kbps. These bitstreams are then allocated their own PVCs between switches. Q-Net uses this technique, and therefore customers have the option of adding voice and/or video circuits.

Both of these applications are sensitive to any delays in switching, such as are normal in IP and X.25 networks. They are given high priority frame relay circuits. The data circuits will receive all bandwidth available after the voice and video have taken their priority requirement. If no voice or video are being used at that time, the data can use all the bandwidth between switches. Should congestion occur, the data frames will be discarded first.

This should not be of concern, as protocols such as IPX, TCP/IP, AppleTalk, OSI or SNA would be operating at ISO layers 3 through 7. These will detect the frame relay problems at layer 2 and request retransmission of the discarded frames. Voice and video frames are not discarded unless severe congestion occurs, as these are real-time events. Retransmission of frames is not desirable as this would produce out of sequence conversations or pictures. Discarding of voice or video frames is normally due to bad network design by not having sufficient bandwidth between switches.

A Window of Opportunity

A number of related issues guaranteed that frame relay could not gain wide acceptance prior to 1993. But users have now been reporting benefits in both these areas, and hence frame relay usage is growing.

There is now a progressive acceptance of frame relay. This is being reflected in increased public network utilisation in the US and Europe, and hopefully Australia will have more public networks shortly.

Market history indicates that every technology has a window of opportunity. Frame relay's window of opportunity is now. If the technology has not significantly increased its market share by 1995, then it may never be a big force in the marketplace in its own right. But does this mean frame relay will disappear? This is unlikely, as there is a sound future for frame relay as an interface technology to ATM and 802.6 networks.

Kevin Slatter is a data communications consultant based in Sydney, NSW. He conducts regular courses on frame relay, X.25, and other communications technologies for Housley Computer Communications.

ATM and the Frame Relay Connection

Asynchronous Transfer Mode (ATM) has had a good share of marketing hype for over a year now. Unfortunately it seems that the less informed the ATM advocate is, the more promises he or she makes for the technology. No wonder the market is confused. ISO, CCITT, ANSI and the frame relay and ATM Forums have all worked together to bring about frame relay and ATM interoperability. They see the technologies as being mutually compatible — not competitive.

ATM is optimised for transmission speeds from 34Mbps to the gigabit range over fibre, but at lower speeds it has two problems. Firstly, this is a statistical multiplexing technique with a minimum overhead of around 20%. The 20% is the 5 octet header in front of each 48-octet cell plus inherent delays and framing control. This does not mean much at higher speeds because the overhead is offset by the more efficient use of the other 80% of the bandwidth. But at lower speeds, try telling a network manager that his expensive 2Mbps circuit has just been cut to 1.6-Mbps or less by running ATM.

The other problem with ATM is that network congestion can occur, and the committees are currently debating when to discard cells, or how long to delay them when it happens. The problem is with delay-sensitive voice and video traffic and is best controlled by intelligent design and by amalgamating as much traffic as possible to achieve a higher gross bandwidth.

ATM has two main applications in the near term. The first is for LAN interconnection and switching within a building or campus where a fibre backbone is installed; the second is for carrier networks. The carrier will consolidate inter-exchange voice and data traffic into one SDH stream of between 34Mbps and 4.97Gbps using ATM. SDH (Synchronous Digital Hierarchy) is simply the physical transmission mechanism used by ATM on the fibre. How then does the customer connect to a carrier's inter-exchange ATM over SDH network?

One way is to bring a high-speed native ATM fibre into the building, but at what cost? If we think 2Mbps ISDN connections are expensive, try pricing a 52Mbps SDH connection! It will be some years before this option is feasible for all but the largest head office buildings. The two most common customer access methods to the carrier's ATM network will be ISDN and frame relay.

ATM is the basis for Broadband ISDN (B-ISDN), so ATM-to-ISDN connection is covered by existing standards. Frame relay is designed for operation in the 64Kbps to 2Mbps range. Speeds above and below this are commonly used, but are less efficient. Frame relay as an interface to carrier ATM networks allows both technologies to operate at their designed performance levels.

Frame relay operation over ATM is covered by the CCITT recommendation I.555, which has the support of both the ATM and Frame Relay Forums. The frame relay frame (payload) is broken into 48-octet ATM cells, then padded out to fill the last cell. This is the Segmentation and Reassembly (SAR) sublayer in the the figure below. The Convergence Sublayer which supports this function is in two parts, the Common Part (CPCS) and the Service Specific part.

The frame relay header is at the front of the frame, and is termed the Service Specific Convergence Sublayer (or FR-SSCS). At the receiving end, the cell payloads are reassembled into a frame relay frame. The Frame Relay Data Link Control Identifier (DLCI) or circuit number is mapped across to the ATM Virtual Channel Identifier (VCI) to ensure correct delivery. This uses ATM Adaptation Layer 5 (AAL5) protocol which is defined in I.363. AAL5 uses all 48 octets of the cell for the payload, unlike AAL3 and 4, and thus places minimal extra load on the ATM switches.

One benefit of this approach is that, at one end of the frame relay circuit the user may be a branch office connection using a normal frame relay interface of, say, 64Kbps, while the other end may be a head office directly connected to high-speed ATM. (The standards make heavy reading on these issues, but a White Paper produced by switch maker Stratacom is much easier to digest.)

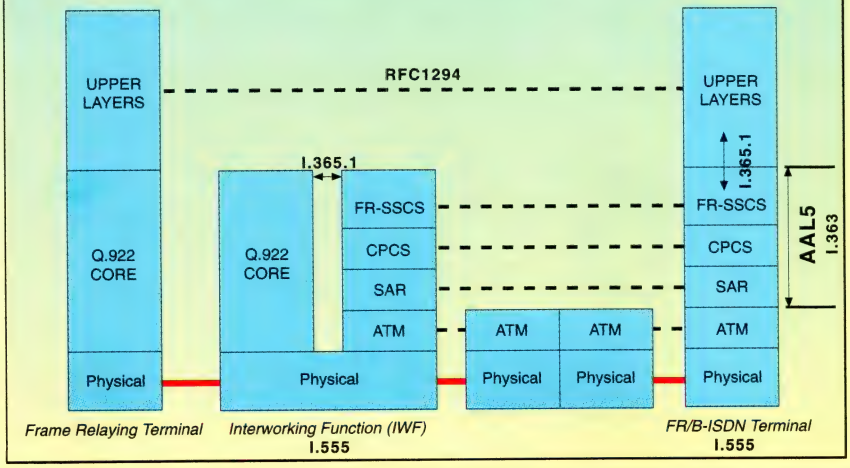
ATM is a mechanism for moving bitstreams, over SDH, as 48-octet cells. The receiving device will assemble these cells into a higher level of intelligence. ISDN will create its Synchronous Transfer Mode (STM) style structures from which it will derive B and D channels. Frame relay devices will assemble cells into frames which are then understandable by computer-style devices. Routers, with native ATM interfaces, would assemble ATM cells into frames. These frames would normally be 802.3 or 802.5 packets encapsulated in frame relay. 802.3 and 802.5 LANs are designed to operate efficiently using large packets of up to 1.5K or 2K. LANs cannot operate with 48-octet ATM cells.

Now we see where computer protocols such as SNA, X.25, TCP/IP and Novell's IPX fit in. At slower speeds they run on LANs or WANs in native mode. Over WANs, at medium speeds, they can be encapsulated in frame relay and operate over a native frame relay network. At higher speeds they can use frame relay frames over ATM cells.

Where does this leave IEEE 802.6 metropolitan area network technology? As used in Telecom Australia's Fastpac service, 802.6 MANs have a similar cell structure to ATM. Some overseas operators of 802.6 services are already offering frame relay interfaces. This follows the same principle as I.555 for frame relay over ATM. Interesting field trials of these techniques have been conducted by Telecom recently, so we may see a commercial frame relay offering over its 802.6 Fastpac service before ATM arrives.

Kevin Slatter

Frame Relay and ATM Protocol Stacks



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Frame Relay Forum

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The need for a service team has been further stressed by MCI in the US, which has pointed out that frame relay is a value added service, and therefore the customer expects a high degree of support. The time taken to build this team has been one of the limiting factors in its network rollout.

Whether to use a private or public network has to be decided on a case-by-case basis. The savings in switches and bandwidth increase as network size increases. Typically, private networks thus need to service trunk speeds of 64Kbps or above, with multiple connected users at each site to be cost effective.

One method of increasing bandwidth between the switches is to add voice and video. The cost savings then can many times outweigh the cost of the extra bandwidth. Where voice and video are added to a private network, the high bandwidth LAN interconnection applications are normally run in low traffic periods. This is often achieved by automating distribution of software and backups for overnight operation. High quality, low error rate lines are are also needed due to the lack of error correction in frame relay. Thus a private network needs sufficient traffic to justify high quality, high-speed lines.

An issue with smaller networks is congestion causing discarded frames. Note that congestion decreases as network size increases. Network size is measured by total bandwidth and number of users. The larger the network, the lower the probability that all users will be bursting data at the same time, and the lower the probability that congestion will occur. Thus private networks need to be large enough to ensure discarded frames are minimised. A good example of adequate size is the Lend Lease network.

Q-Net's Trailblazing

One of the fastest network deployments to date has been by Q-Net Australia, but it still needed 5 months for installation of initial sites, after tender evaluation and selection was completed.

Q-Net was created in the mid-1980s to satisfy the voice and data networking needs of the Queensland Government. By the late 80's it had established an extensive terrestrial and satellite network in Queensland. In 1988 the organisation was taken over by Nine Network Australia.

Q-Net now offers services Australia-wide and has over 60 commercial customers. Its heaviest traffic route is currently Sydney-Melbourne (via Telecom Megalinks) and it has a presence in all capital cities and most regional centres in Australia. Brisbane, Adelaide and Perth are serviced by 2Mbps ISDN Primary Rate interfaces.

As well as on-selling and managing bandwidth, Q-Net operates one of Australia's largest frame relay networks. The 1991 decision to implement frame relay was a commercial one. The technology could switch more packets or frames per second than any alternative. This meant more data in the pipe which gives better flexibility at a lower cost to the customer. Q-Net's Netrix-supplied switches also gave flexibility in being able to operate in both X.25 and circuit-switched mode. Frame relay implementations supported include both the ANSI LMI and the CCITT/ANSI CLLM.

Q-Net offers a variety of FRAD services for HDLC/SDLC bit oriented protocols. These include SNA, TCP/IP over PPP, OSI and DECNet. It also compresses voice to run over frame relay. The network is currently being upgraded with integrated voice and video cards to enhance this service.

A good example of a data user on Q-Net's frame relay net is the Australian National Line (ANL), a major container and bulk cargo shipping company with regional offices in major Australian cities.

ANL was running a combination of low and high-speed lines from Telecom (Datel and DDS) and Optus. These linked terminals in the regional offices to their Melbourne head office facility, and LANs in major centres. It now uses the Q-Net frame relay network, with its Infotron and 3Com terminal servers in the remote locations connected to local Q-Net hubs.

For ANL, the major advantages are reduced annual line rental charges, a small change over cost to the new service, and facilities management. Facilities management includes network monitoring and management, detailed usage statistics and responsibility for the tail circuits linking the local Q-Net hubs to the ANL locations. It also includes leased circuits to Burnie and other Tasmanian offices. These locations will be connected to Q-Net nodes as their network expands. And ANL has the option to later add voice traffic to this network.

A Private Approach

In contrast to Q-Net/ANL, Lend Lease, a major Australian corporation, decided to build a private frame relay network to meet its growing communications requirements. The company operates Australia-wide and has large Fujitsu, IBM and DEC data centres in Sydney and Melbourne. In addition, LAN utilisation is expanding.

By 1990, Lend Lease recognised that the separate data lines it was running for the different protocols were expensive, needed separate management systems and were inflexible in bandwidth utilisation. After an extensive evaluation the Lend Lease network management team rationalised these nets into one frame relay network using Netrix switches. The switches are in every Australian capital city, linked by multiple 64Kbps lines for performance and resilience. The Sydney-Melbourne link, and local connections in these cities, are currently being upgraded to 2Mbps.

Frame relay was selected as the only viable technology to dynamically allocate bandwidth to such a wide variety of applications. As well as the bursty nature of LAN traffic, specific applications had to be taken into consideration. Lend Lease Employer Systems (previously MLC Payroll Services) operates one of the largest public payroll systems in Australia for its customers. This application is obviously time-critical and required the network be designed with resilience. The switches automatically reroute if a line goes down or if excessive load is experienced on one line, and there is the ability to manually override.

A thorough traffic analysis and capacity planning exercise was completed before the network design was finalised. The network has been operational for well over a year now, and is meeting expectations. The decision to go with frame relay over proven technologies like X.25 was not only because of its ability to handle voice and data, but also to provide a firm base for future needs. Planning is already under way to add video.

Cost/Performance Benefits

There are three major cost/performance benefits in frame relay, and these relate to both private and public networks.

Firstly the bandwidth between the switches is shared by all users. In a private network this means that one high-speed line — for example, 64Kbps between Sydney and Melbourne — is used to connect the switches. The users connect to the switches in their city and share the 64Kbps line, which will be cheaper and faster than multiple low speed lines. The multiple lower speed lines can be amalgamated into one or more high-speed lines due to the ability to run multiple higher level computer protocols over frame relay. Lend Lease provides a good example of this, as it runs a mixture of SNA, FNA, DEC LAT, TCP/IP, IPX and AppleTalk between switches.

Note that if only one or two of the protocols running across the Lend Lease network is operating in one instance in time, then they will receive all available bandwidth. This is what makes frame relay very effective for LANs. LAN interconnection is characterised by extended periods of no traffic, regular small bursts, such as in retrieving a document or spreadsheet, then occasional large bursts such as backups or software distribution.

In public networks the bandwidth between switches is higher and more users (customers) are connected to the switches. The same savings in sharing bandwidth apply, and these are passed on to the user in reduced monthly charges. The cost savings in using public networks are more pronounced the greater the number of sites that are involved.

Each site pays an access charge, and normally a CIR charge. In Booz, Allen's

mand offerings; dedicated, leased, point-to-point circuits (fractional and full T1); X.25; and frame relay.

SMDS faltered right out of the gate. It wasn't really available in most areas, nor could the local carriers supply references from customers who were actually on production SMDS networks. On the international side, SMDS was a bust, and the long-distance carriers were yet to support it.

X.25 was ruled out almost as quickly. Our tests indicated that, as a result of X.25 overhead, the maximum sustained throughput that AppleTalk could attain on a 56-Kbps X.25 link was 9.6Kbps. The company also evaluated four switched digital services, but while all of these offered high performance and the ability to handle video, voice and bursty traffic, analysis showed that the inverse muxes used to deliver bandwidth on demand weren't all that flexible. Also, switched digital services are expensive.

That left two candidates: dedicated circuits and frame relay. The leased line option scored very high in every category with the exception of price. Frame relay's price, on the other hand, was so good that staff felt the firm couldn't afford to pass up the chance to evaluate it further.

Potential Problems

That's not to suggest that frame relay was embraced unreservedly; in 1992 it was an immature technology, with no more than 40 operational sites. Carrier offerings were limited, and international frame relay was almost non-existent. Security also posed a big problem: the firm was worried that frames might be accidentally retransmitted onto another customer's network. Quality was a big question mark, and there was no way of telling how LAN protocols would do on a frame relay net.

Management and administration also caused concern, particularly since frame relay had no real-time network management system (still a major shortcoming).

Like X.25, frame relay is a packet-switched WAN technology that sets up logical circuits rather than physical circuits, as is done with leased lines and switched digital services. Frame relay's committed information rate (CIR) is the amount of bandwidth a carrier reserves for those permanent virtual circuits (PVCs). Frame relay's hot ticket is that it lets you burst above the CIR when the traffic gets really heavy. You pay up front for the ability to burst, and if you don't actually use your burst bandwidth, you get credits toward next month's bill.

Once Booz, Allen decided to go with frame relay, staff had to set up a prototype network that would simulate the communications environment, provide some confidence in the technology, and help come up with an accurate RFP.

The idea was to give frame relay a thorough workout, to see it in action using the company's applications: e-mail, IBM host-to-terminal access and remote job entry, client-server databases, file transfers, and remote LAN access. It was also necessary to make sure that the required protocols could be accommodated: AppleTalk and TCP/IP. In addition, staff wanted to see how loading affected performance and whether dynamic bursts were really going to perform as promised. They also wanted to get a feel for network management, carrier diagnostics, router diversity, and disaster recovery planning.

The pilot network was up and running within 45 days, with much of that time spent waiting for the local exchange carriers to install the local T1 access lines. Switch ports were set at 512Kbps (for bursts), and fully meshed 256Kbps PVCs were established between our three test sites.

The pilot demonstrated not only that frame relay could handle AppleTalk and TCP/IP, but also that data integrity was not going to be an issue. Tests revealed no frame slips or misaligned frames; essentially, you couldn't tell the difference between applications on leased lines and frame relay. In addition, message delivery times for e-mail were impressive, even for a store-and-forward application, as were file attachments and enclosure delivery (better than twice as fast as dial-up connections).

Host-to-terminal tests were just as successful, and it looked as if file and printer sharing were the only applications that actually needed dynamic bursts.

The Final Frontiers?

Since first implementing the network, Booz, Allen has become very interested in linking offices in Paris; London; Dusseldorf, Germany; Wassenaar, the Netherlands; and Singapore via frame relay. At this point, the firm is testing 64Kbps PVCs to HQ, with 32Kbps between each office.

From Booz, Allen's perspective, the best thing about frame relay is that it doesn't lock the company into dead-end technology. As ATM (asynchronous transfer mode) comes on-line over the next few years, the company could conceivably use it to integrate voice, video, and data on the same network. All that would be required would be to replace the CSU/DSUs and change the software on the routers.

Daniel Gasparro, Network Quality and Assurance, and William DeMartini, Booz, Allen & Hamilton.

sidered. Frame relay caused much concern early on because it can discard frames due to congestion. The way to avoid this, or automatically recover from discards, is fairly simple, but needs to be understood before the technology can be accepted.

Pricing is the other issue where the network manager will have concerns and needs to be educated. Managers have been accustomed to paying for bandwidth as a fixed pipe of constant bits per second. To be charged one figure for connection to a public network, with another charge for use, needs some understanding before committing to any budget estimates. This problem is further aggravated in the US, where public networks have different pricing structures. Most have a connection charge based on speed of connection, then some form of usage-related figure. Usage is sometimes charged by committed information rate (CIR), and sometimes by permanent virtual circuit (PVC), or by traffic. Most carriers offer combinations of these, which is even more confusing. MCI reports that management understanding and expectation on pricing is one of the major hurdles in a frame relay sale.

The third issue is one of actually connecting to a frame relay network. The customer will need to use a Frame Relay Access Device (FRAD) if he wishes to connect non-frame relay capable equipment. This includes many existing SDLC, X.25 or PPP devices. This often increases the connect cost and can slow down the throughput, as was found by Australian frame relay implementor, Lend Lease.

The preferred option is to connect directly using a frame relay interface. This requires such an interface being available, as a software or hardware upgrade, for the router, switch or computer being connected to a public service. To install a private network the frame relay switches themselves also have to be available, and they will need the more recent features such as CLLM for congestion control and prioritisation for video and voice. Interfaces for connecting equipment and good switches are now readily available but were not so before 1992. There is also the need to certify the interoperability of the interfaces on the different equipment, and the lead time to evaluate the technology itself.

In the Public Interest

Another issue is the time delay between the announcements of the availability of public networks and those networks having both a wide geographic spread and a large team of customer support staff. This is not unique to frame relay, it is common to all network technologies and has been seen before in the lengthy introduction cycles of public X.25 and ISDN systems. Reasons for this include the time taken by the network provider to evaluate and obtain switches, train staff, then deploy and test the switches.

Booz, Allen Builds a Frame Relay Network

Perhaps it's only fitting that US-based Booz, Allen & Hamilton implemented a full-scale frame relay network back in 1992, when the technology was still untried and untested. After all, the worldwide management and technology consulting firm maintains a dozen hardware and software laboratories of its own and has served as prime contractor and systems integrator on many advanced programs, including the computer simulations that established the best payload sequence for the on-orbit assembly of the space station *Freedom*.

With clients in more than 75 countries (among them, 70 of the 100 largest companies in the world and more than 400 of the 500 largest industrial corporations in the US) Booz, Allen understood that a state-of-the-art corporate backbone was essential to its ability to compete in a global marketplace.

The frame relay internetwork replaced an outdated WAN that ineffectively mixed X.25, T1, and dial-up async lines. The new backbone cost the company $US50,000 a year more in telecom charges — a small price to pay for a network that links all of its regional offices to corporate headquarters and has the bandwidth to support bursty applications like e-mail and client-server databases. What's more, the choice of frame relay has resulted in savings of more than $US150,000 a year in telecommunications charges over the leased line alternative, which was added to savings of approximately $US100,000 in routers and CSU/DSUs. That's not too shabby for a networking scheme often written off as a technology in search of an application.

Under Strain

In March 1992, when Booz, Allen began looking for ways to revamp and extend its wide area network, it was clear that the WAN was out of date and out of touch with corporate requirements.

The backbone at that point comprised three distinct elements: a 9.6Kbps X.25 network that gave some — though not all — regional offices access to applications running on the corporate mainframe; a T1 network that tied two other sites into the same host applications; and a 9.6Kbps dial-up modem network that many offices counted on for electronic mail and other communications.

If this sounds inefficient, it was. Worse, some of the firm's consulting business actually relied on the modem network, which was regularly used to exchange database files, spreadsheets, reports, and graphics across analogue lines as e-mail attachments. The e-mail network — served by a pool of gateways at corporate HQ — was starting to show the strain. There's nothing like a steady stream of sizable attachments to make all too real the 'glacial response times' the press is so fond of discussing.

Something had to be done. But what? It was easy enough to see the problems. Finding workable solutions was another matter. After months of hands-on evaluations, the company came up with an answer: frame relay.

While frame relay costs about 50% more a year than the firm was paying for X.25, there's no comparison in terms of connectivity, performance, throughput, and scalability. The company now has 256Kbps circuits linking seven regional offices into its headquarters, along with 64Kbps circuits between regional offices. Where local exchange carriers (LECs) couldn't deliver frame relay, T1s were put in place.

In short, Booz, Allen & Hamilton is now the proud owner of a wide area network that can support bursty applications like e-mail and client-server databases — the ones that it uses to get its consulting work done. And after almost a year up and running, the firm has found frame relay as reliable as leased lines.

The Old Order

In Booz, Allen's original WAN the X.25 service gave five of the company's regional offices (London, Paris, New York, Chicago, and Florham Park, New Jersey) access to accounting, finance, and control applications running on an IBM 3090 mainframe a few miles away from corporate headquarters (in McLean, Virginia). In essence, the X.25 network was used for terminal-to-host applications utilising SDLC (synchronous data link control).

Each of the offices had an IrmaLAN gateway that was responsible for converting AppleTalk into SDLC and shipping the frames to an X.25 PAD (packet assembler/dissembler) for encapsulation. The PAD forwarded them to the main office, where another PAD stripped away the X.25 envelopes and shunted the SDLC data onto a 56Kbps leased line that ran to the mainframe.

The rest of the network consisted of 9.6Kbps dial-up modem links between some 23 offices in the US, Europe, and Asia (including those on the X.25 network). Some of these sites were home to Apple EtherTalk networks, as about 60% of the company's network users are on Macs. Add to this mixture the 10Mbps Ethernet local area networks that also had been established at various branch offices, and TCP/IP became yet another protocol to be reckoned with.

Users at all the offices were working with a range of desktop applications, and nearly 70% of the offices had access to Microsoft Mail for the Macintosh. E-mail, in fact, was the main way that information was shared company-wide, and this could result in some pretty hefty files being sent over the modem network as e-mail attachments. Unfortunately, the company soon had a difficulty to contend with. The mail system was such a big success that the original traffic estimates proved to be far short of the mark.

At this point, disaster struck. The trunk line that served several key mail gateways was accidentally reprogrammed, and the entire domestic e-mail system was shunted onto a trunk that was known to have problems. The modems could dial-up the gateways in the different offices, and could make the connection, but the gateway was no longer able to pass the file to its destination. By the time the problem was rectified, after around one day of troubleshooting, about 2,000 mail messages had backed up on gateways throughout the enterprise.

The good news, if there is good news in this sort of disaster, is that when the mail system backed up, Booz, Allen's network staff had already begun to look at the way the company's WAN was configured, and at the range of possible solutions.

The goal in designing a new WAN was to establish a standard, scalable wide area technology that could first meet data networking needs and later address voice and video requirements — in the most cost-efficient manner possible.

Evaluating the Options

The first step was to review networking applications and requirements across the enterprise and establish baseline criteria. Client-server SQL databases were being used widely and had to be accommodated, as did e-mail and a variety of desktop applications. File services, especially online mapping of local drives to remote servers, also ate up a lot of bandwidth. Remote host-to-terminal connectivity had to be maintained, and the small packets used for screen updates and printing also took a big bite out of the bandwidth. At the same time, Booz, Allen & Hamilton was looking to roll out a global executive information system, and that would have to be factored in as well. It was realised that a minimum of 56Kbps would be needed (partly to accommodate AppleTalk, which was highly sensitive to delays).

Four candidates were evaluated: switched digital services, including SMDS (the US Switched Multimegabit Data Service) and some of the bandwidth-on-de-

Who's Making the Switch to Frame Relay?

With its slow take-up so far, it's easy write frame relay off as simply last month's networking fad, but, as Kevin Slatter explains, the technology has much to offer now and in the future.

Frame relay has been the subject of many technical articles since 1990 when it was first specified (see in particular 'Time to Get Ready For the Frame Relay Race?' *Australian Communications*, March 1992). This has been followed by much speculation that frame relay is either the answer to the networker's dreams, or has been a failure. On closer examination, neither of these assumptions appears valid. The acceptance rate of frame relay has been steady but not spectacular. This has more to do with market practicalities than any shortfall in the technology. There must be quantifiable benefits in either cost or features, otherwise a technology will not gain market acceptance.

In 1991 and 1992 much was expected of the new technology but not very much happened. Indeed, we need to study the US experience to gauge the technology's progress, because little has happened in Europe, where BT and France Telecom are only now implementing networks; and Australia, where Telecom only announced the commencement of trials from the beginning of last month. Outside of the US, only Telecom Corporation of New Zealand has made real progress towards offering a frame relay service.

US West is an RBOC offering a public network over a large area of the west and north west of the United States. It reported only 32 customers by June 1992, well below market expectations, but anticipates over 90 additional customers by the end of this year. This is a growth in customer ports from 600 to over 2,000 in 6 months. MCI, which offers a national network in the US, reports similar growth, with around 400 customers now, after a very slow start.

There are four main reasons for this slow start, yet steady rise in traffic: organisations do not change a network design or technology quickly; network managers need time to understand new pricing and technology issues; suppliers of computing, switching and routing equipment need time to implement interfaces to frame relay; and operators of public networks need time to build infrastructure and train staff.

Networks Change Slowly

Networks used by organisations are normally installed after a thorough planning, evaluation and tendering process. The installed network, whether it uses public or private facilities, then represents a large investment in both time and money and needs to be stable. After installation, additional sites and higher speed lines will be added. The basic technologies used (e.g. SNA, X.25, IP) will not change due to the need for stability and compatibility. There is also the cost of evaluations and training if new technologies are considered.

The opportunity to use a new technology would normally only present itself when the network reached its cost or performance limits, and needed a major upgrade or replacement. This normally happens every five to eight years and then justifies the planning, evaluation and tendering processes.

The second reason for slow acceptance is that network managers need reliability and stability from a network. New technologies and new pricing structures need to be understood before being con-

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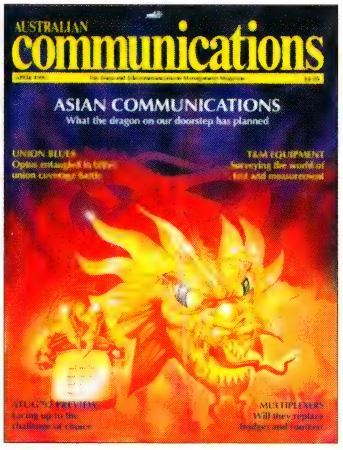

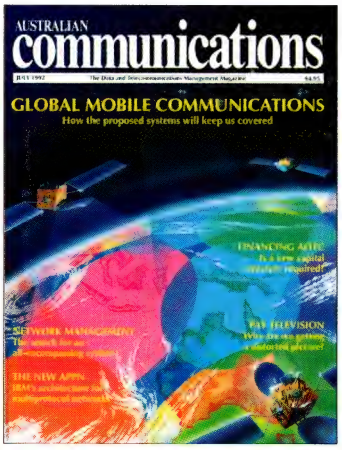

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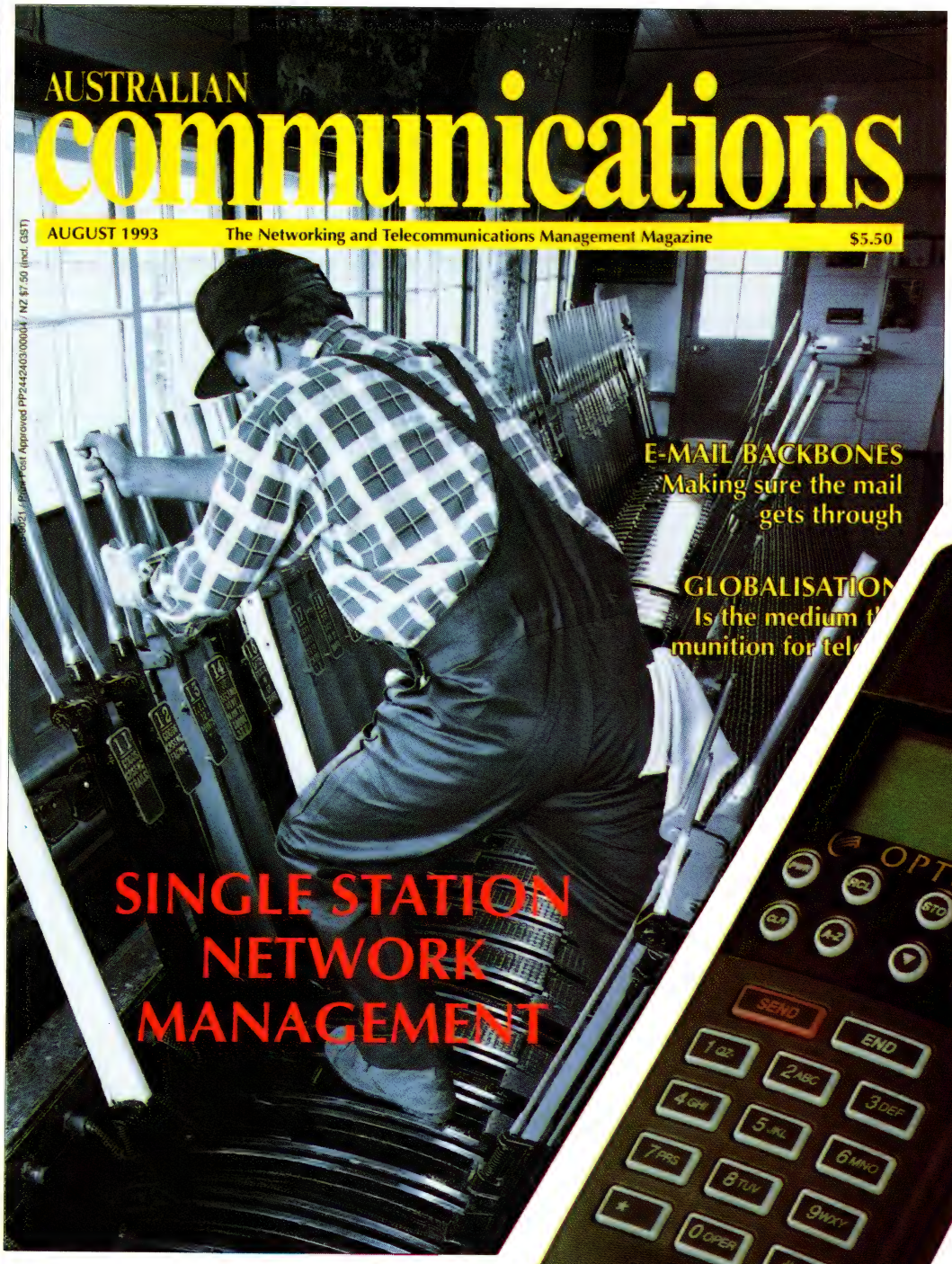

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specifications. And beyond the specifications, the licensing of the DME software provides a common, open platform for different vendors to develop products. Such openness facilitates competition, benefiting users.

- *The DME is released as real software.*

This is perhaps the greatest strength of the DME. It is not just a specification, but a software infrastructure, ready to build upon. As a software builder of management products, if you do not adopt the DME infrastructure, you must design and build your own from the ground up, and support it into the future. In terms of development time and cost, the DME option has great appeal.

Offsetting these strengths are the potential weaknesses of the DME:

- *The DME does not cater for many of the industry's legacy networks.*

The DME requires DCE services, so that despite the potential use of adaptor objects, non-DCE networks, such as those based on SNA, will be outside DME's domain.

- *Microsoft PC LANs may also remain on the periphery of the DME.*

Although Microsoft has included RPC compatibility in Windows NT, reference to the DME is conspicuously missing from the standards it proposes for Windows NT System Management Server, also known as Hermes.

As discussed, the availability of DCE RPC provides an opportunity for other software vendors to develop DME connectivity products for PC LANs. The extent to which Microsoft's lack of enthusiasm for the DME will impact DME's success remains to be seen.

- *There is also a danger that public telecommunications operators (PTOs) may decide to turn their backs on the DME, adopting SPIRIT in preference.*

The PTOs have been disappointed that DME was not stronger in the implementation of the CCITT's M.30 Telecommunication Management Network (TMN) standards. British Telecom, AT&T and the Regional Bell Operating companies are currently drafting a platform specification entitled 'Service Providers Integrated Requirements for Information Technology,' which is based on the work of the Network Management Forum and which provides a framework oriented towards development of TMN applications.

So can we regard DME as the strategic management solution, one which can be adopted with confidence? Or will DME suffer a fate like OSI, where much was promised but a decade later the promise remains largely unfulfilled? Irrespective of whether the 'grand vision' of DME as the predominant distributed management platform is achieved, what we can say with confidence is that, like OSI, the DME will certainly bring significant technology benefits to the management industry — for example, the distributed object request broker concept and the XMP API.

My view is that in the distributed Unix environment, the strengths of the Distributed Management Environment will ensure its success — its adoption will build up momentum throughout 1994-95, and it will establish itself as the strategic choice for distributed management. Whether this also happens in the PC local area network environment depends largely on the success of Microsoft's Windows NT — success for NT and Hermes will reduce the prospects for the DME.

Whether the DME will succeed with the PTOs is even more difficult to pick. Their specific network management requirements are large and specialised, as corporations they are eager to expand, and they are sufficiently flush with funds to build their own solutions without waiting for the DME.

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clients will provide a command line interface, also based on the ISO DPA service, for user access to the printing system. These allow control of print requests (e.g. submit, query) and management of printer spoolers and supervisors.

■ *Software Licensing*

The approach adopted by the DME software licensing system is for application programs and PC configuration control programs to query a licence server to gain permission to run the application or to set up the proposed configuration. They will do this by means of an interface called the 'licence library.' This library will provide an API that the application can use to issue licence queries and requests for the granting or revoking of a licence. The licence library will use DCE RPC to bind to a licence server and pass the queries and requests, while at the same time isolating the calling application from these connectivity issues.

Licences will be created by the application supplier, using the DME licence generation tool. The licences produced will contain encrypted passwords reflecting product, vendor and site information. They will be forwarded to the application licensee for storage in the site licence databases.

At user sites, licences will be managed by DME licence servers, which provide interfaces to handle client requests and licence management. As mentioned, licence library clients will use RPC to do licence transactions with the server. All such calls to the licence server will be authenticated, to prevent masquerading as either a licence library client or another server, and all transaction requests will be checked against access control lists. Each licenced server will have its localised site specific database, containing current licence and user information, with the contents encrypted and validated to prevent tampering.

The DME will provide a command line interface to support licence administration, although typically user access will be via a licensing application.

■ *DOS PC integration*

The OSF originally had grand plans for bringing DOS PCs into the DME. Plans which included a PC-agent with such functions as reporting the PC configuration, changing directory and reporting contents, receiving or sending a file, and re-booting.

However these plans have been overtaken by the marketplace, as DCE services for PCs start to emerge — for example, Gradient's DCE for DOS Windows is available, and Microsoft, IBM and Novell have each announced plans for full or partial DCE services for PCs. The OSF now expects many of the functions it originally planned for DOS PC integration will be provided by software vendors taking advantage of this emerging DCE/RPC capability on PCs.

Consequently, the OSF's DOS PC integration plans for DME have been scaled back and centre on a piece of software called the DOS ally, which will run in each PC in the DME network. The DOS ally is a terminate-and-stay-resident program, which will provide simple UDP-based communication with DME servers. Built on the DOS ally will be the PC licence library function, providing software licensing as described previously.

Peter Johnson

and network management components of Atlas from Unix International, and the Network Management Forum's Open Management Roadmap, marked out by its OMNIPoint releases. In fact, the DME is not really competing with either of these two; rather it is in accord with both.

Unix International, which is a consortium of over 300 member companies with a focus on Unix evolution, announced in June last year that Atlas would be compatible with DCE and DME, and would interoperate with them.

Another consortium, the Network Management Forum (NMF) also aims to foster the adoption of network management standards, particularly OSI management standards. The initial release in 1990 of the NMF's specifications made little impact on the industry. However, the more substantial OMNIPoint 1 release, which represents the first milestone on the Forum's road to open management, was issued in late 1991 and has garnered far more industry support.

The OMNIPoint 1 specification includes the XMP API, the Instrumentation Request Broker, and CMIS/CMIP, all of which are part of the DME. The OMNIPoint 2 release, with more complete standards, profiles, configuration testing, and platform information is due end-1994. The OSF, which is working closely with the NMF, has indicated that where DME overlaps with NMF OMNIPoint functionality, the DME will conform.

A DME Management Strategy

So how important a role will the DME play in network and systems management in the industry over the coming years? Will it be the unifying force in distributed management? Firstly, let's consider its strengths:

■ *DME is emerging as a practical and pragmatic distributed management solution, with indications of widespread industry support for it and its base technologies.*

For example, the underlying DCE framework appears poised to move ahead strongly, with 25 vendor companies successfully demonstrating DCE prototype products at the OSF Challenge '93 exhibition in May this year. DCE-based products have become available from IBM, Hewlett-Packard and Gradient Technologies, and DCE products are apparently in the pipeline from Digital Equipment Corporation, Groupe Bull, NCR Corporation, Novell, Siemens Nixdorf, Sun Microsystems, the Santa Cruz Operation, Unix Systems Laboratory and others.

Similarly, the CORBA object technology that is essential to the DME framework is also getting strong support. The Object Management Group that is defining CORBA is a substantial international consortium, with over 300 member companies. CORBA has also been adopted by the Common Open Software Environment (COSE) group. IBM, HP and Sun, who are COSE members, have gone a step further and are working together to define a standard interface that will allow their CORBA-based products to interact.

On the network management side, we have seen that the DME specifies use of the XMP API. This API was originally part of the technology proposed to the OSF for the DME, and was subsequently picked up by the X/Open consortium and has also been endorsed by the Network Management Forum. This broad industry support indicates that XMP has become the de facto standard API for distributed management applications.

As these crucial DME components lead the way and their adoption gathers momentum over the next 12 to 18 months, the DME will be carried along with them, building up a momentum of its own.

■ *The DME provides a unifying model for both systems and network management.*

DME allows for development of applications that are seamless across the two management areas, and allows higher level applications to build on lower level application components. It allows the OSI CMIS/CMIP world and the TCP/IP SNMP world to be referenced in a common way. It could be said that these characteristics address just the bare essentials in unifying differing management camps, but they nevertheless represent a significant advance.

■ *The DME is an open solution.*

The underlying DCE specifications are currently published and available in text book form. The DME architecture and interface specifications are available to any organisation that wishes to join the OSF as a Snapshot licensee. To facilitate this openness, the OSF has recently revised its fee structure to make it easier for small companies to join as licensees. In time, the DME specifications will be as available as the DCE

DME's Distributed Services

DME Distributed Services are not part of the object oriented DME framework, but they have been included by OSF in the DME because they are a vital part of the overall administration function necessary for distributed management.

■ *Software Distribution and Installation*

The DME software distribution model calls the software repository or source a 'depot' and the destination of a distribution a 'target.' The depot contains software products, broken down into their component parts or elements, each uniquely identified network-wide. It also contains control files, identifying depot contents and element dependencies. A depot agent acts as the centre of the software distribution system, controlling one or more depots, and responding to multiple requests. Software is packaged for distribution by a package generation tool, which outputs the product information and the product code in a standard way, suitable for various media (e.g. the depot file system, CD-ROM, tape).

Each target node in the system also has a software distribution agent. Its function is to respond to requests to list, install, or remove software product elements. The target agent maintains a set of control files called the Installed Product Database, which reflect the node's software status.

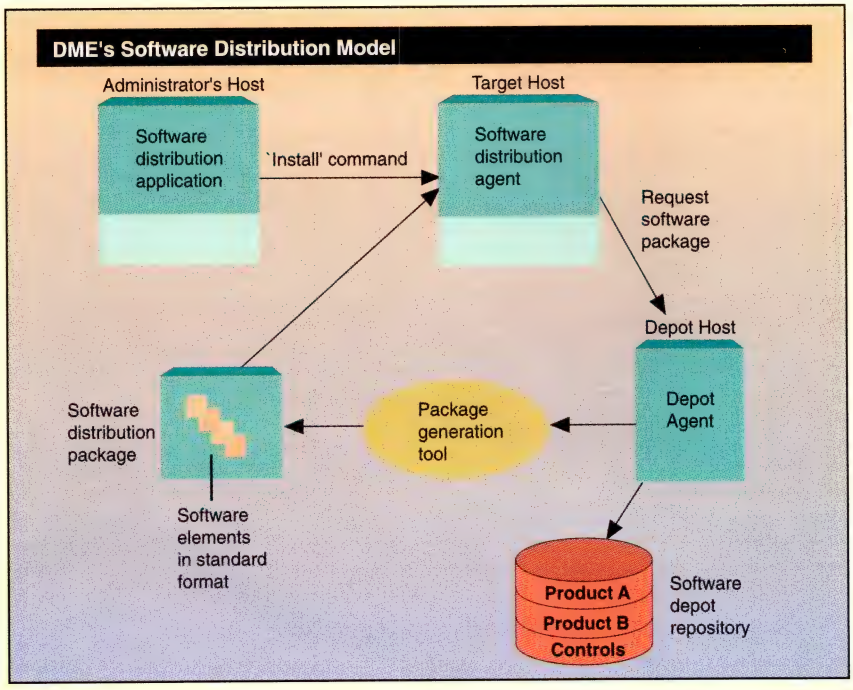
Software distribution will most commonly be invoked via a vendor's software distribution application, although a DME command line interface will be provided. Typically, the controlling application will pass information to each of the target nodes identifying the software status they should have; each target agent would then liaise with the depot agent to arrange installation of the required software elements.

■ *Printing*

Clients of the DME print system will typically be application programs providing a front end for user print requests. These clients can use the DCE Name Service to determine the names, characteristics and locations of available printers and their associated print servers or spoolers. The primary API available to client programs is the printing Systems Programming Interface, used in the POSIX 1003.7 printing standard, which provides the low-level, detailed control needed for graphical interfaces.

Print spoolers act as the high level interface to print clients, both receiving and scheduling requests, irrespective of the type of target printer. Spoolers use the protocol of the ISO Distributed Print Architecture (DPA) draft standard to interface to printer supervisors, which then interface directly to specific printers.

So printer supervisors are responsible for mapping the generic DPA protocol to the attached printer protocol. This division of printer supervisor functions into a generic part and a device-specific part will allow the easy addition of new printer devices in future. In addition to vendor-provided printing applications, DME print



to develop applications based on the distributed services.

The Reality Today

Although OSF shipped DME Snapshot 3 in June this year, it will be 12 to 18 months before the full DME software suite is available as commercial quality code. (Snapshots are pre-release versions that OSF members can obtain to facilitate early development of management applications.) Of the various development activities that make up the DME project, the distributed application services are the furthest advanced. They are currently in system test, with Distributed Services Release 1 scheduled for end-1993, apart from print services, which is scheduled for mid-1994.

The object oriented DME framework can be considered as coming in two parts: network management and object management options. The development of the network management options is well advanced. Snapshot 3 includes the major network management components, such as the XMP API, the IRB, and the SNMP and CMIP protocols. These components are currently being integrated, with availability of the framework network management options scheduled for mid-1994.

It is the distributed object support that has been the cause of much of the delay suffered by the DME. The OSF originally intended to utilise software from HP and Tivoli as the basis for object management, including Tivoli's object request broker. This was prior to the creation of the Object Management Group's CORBA standard.

Subsequently OSF decided that because of the swift acceptance of object oriented technology in general and the CORBA standard in particular, the initial release of DME should be CORBA compliant. This meant that although the original object management services could be retained, the object request broker would require redevelopment to align with CORBA. Unfortunately, the current CORBA 1.1 specifications are not sufficient to guarantee interoperability between distributed object request brokers.

So OSF is working with and providing input to the Object Management Group's development of a CORBA 2.0 specification. This specification is not expected to be completed until early-1994, which means implementation of the object management options within the DME framework will be delayed until end-1994. This commercial release of DME will be available on OSF/1; there will then be further delays as vendors port the DME software to their own Unix-based platforms and complete development of their DME management applications.

And what of DME alternatives? Those most commonly mentioned are the systems

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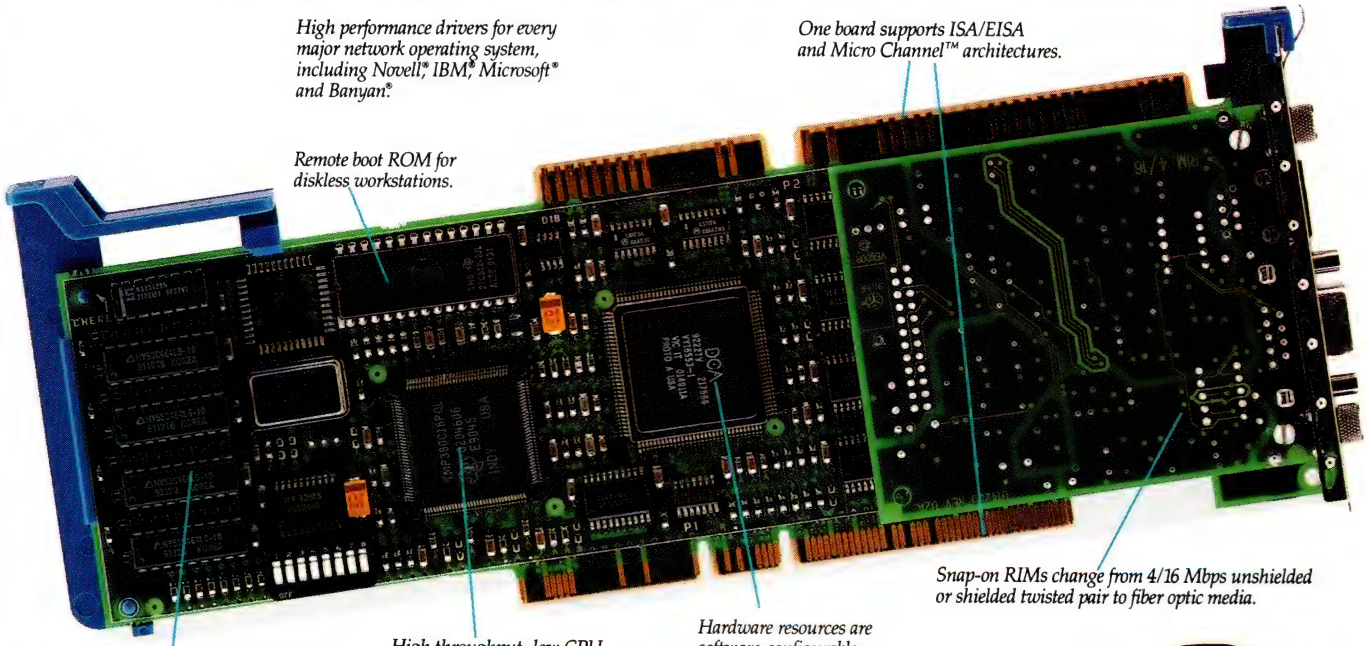

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with its non-DME application on the one side, while on the other side it would use the standard Method API for communicating with the object server.

■ **SNMP & CMIP Support**

It is OSF's aim that any resource that can be managed via SNMP or CMIP can be accessed and controlled via DME objects. Such objects will use the DME implementation of the X/OPEN Management Protocol (XMP) API (application program interface). This API, which had its origins in OSI's Common Management Information Services, provides a common syntax for accessing both SNMP and CMIP resources. Note that although the syntax is common, the semantics of SNMP and CMIP differ, and this must be reflected in the way XMP is used.

The objects that use XMP will typically be adaptor objects (see 'DME's Object Oriented World' on page 94), which present a DME-compliant interface. SNMP traps and OSI events will pass via the adaptor objects and their interfaces to DME event services. XMP in turn uses the Instrumentation Request Broker (IRB) which implements both the SNMP and CMIP protocol stacks. This structure allows other protocol stacks, or updated versions of the existing ones, for example SNMP 2, to be added to the IRB without impacting existing applications.

The XMP API is seen by the OSF as another approach to incorporating non-object oriented applications into the DME. Because these applications do not fit into the DME's object oriented framework, they cannot take advantage of the reuse and sharing of common object services, such as provided by presentation, storage and base application objects. Nevertheless, these non-object oriented applications can share access to the managed resources in the network via XMP.

■ **DME's User Interface**

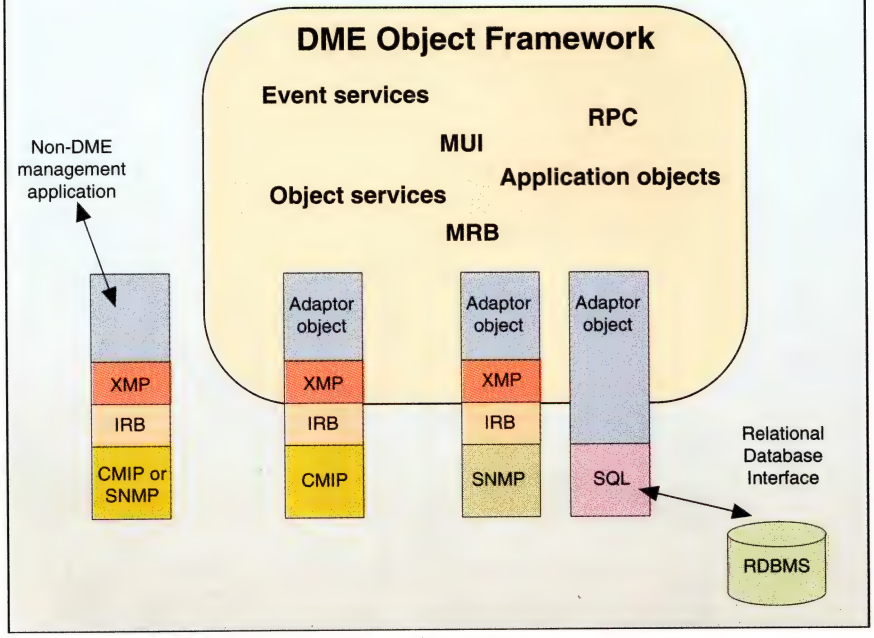
The Management User Interface (MUI) service provides all DME objects with a common way of interacting with users. The design of the MUI server is such that it can be implemented using a variety of GUI toolkits, enabling implementation on a range of platforms. The OSF will initially deliver a MUI server based on the OSF/Motif toolkit.

To specify how dialogues with users are presented and controlled, the OSF plans to create a DME dialogue language and compiler. When defining a dialogue, the developer will use this language to specify the presentation attributes of forms and their layout characteristics, the object method calls or MUI built-in functions to be associated with user actions on display components (e.g. when the user selects from a list), and dialogue variables.

Such definitions will be compiled with the DME MUI compiler to produce dialogue descriptors, each one of which will describe a possible GUI window dialogue. The methods offered by an MUI server act on these dialogue descriptors. An application object can call an MUI server method to post a dialogue descriptor (i.e. activate it to run asynchronously, with event notification). The application will then be called back by the MUI server when a presentation event occurs, enabling the application to control the dialogue flow.

Figure 2: Interfacing to Real Resources

Adaptor objects are the primary way of connecting the DME object oriented framework with external protocols and systems.



■ **Distributed Notification and Event Services**

A notification is a message announcing the occurrence of some asynchronous event (typically an alert or trap). The notification will have been generated by an object interface or an application, as an unsolicited, undirected message. This message will include a unique notification ID and parameters indicating the nature or impact of the event.

Most commonly, notifications will be defined as part of DME object definition, however notifications may also be type-independent and can be defined independently of a specific interface. This will allow easy re-use of a notification in multiple object interface definitions. For applications that are not object oriented, the DME will provide a template to guide the definition of notifications. In both cases, compilers will generate code that can be used to issue the notifications.

When a notification is emitted, it will be intercepted by event services and filtered. This will result in the notification being deleted, logged, or forwarded to another object. The selection patterns on which the filtering is based are generally interface-specific and are managed by event services so as to be available throughout the network. Each host system can also have its additional system-specific filtering patterns. Applications or objects that want to receive notifications register their interest with event services. Logging of notifications can be done on the event server's local log file or by forwarding notifications to a log server. This latter approach will typically be useful in the case of a distributed application or distributed object instances.

■ **Distributed Application Services**

The object oriented framework described above is undoubtedly the centre of attention in DME discussions — it has all the glamour. But there is another side to the DME that is often overlooked — Distributed Application Services. This is the pragmatic side of the DME (see 'DME's Distributed Services' on page 100).

The OSF recognised that powerful as its object oriented framework will be for developing management solutions, there are some specific management tasks that require immediate attention. So it has defined application services for software distribution, printing, software licensing, DOS PC integration, and an interim version of the event service. Note, however, that these services are not part of the object oriented DME framework. Rather, they are standalone services that can be used independently, provided as sets of modules with well-defined APIs.

The OSF had also planned to provide simple 'proof-of-concept' applications for the software distribution, printing, and licensing cases. However this now appears unlikely, and the OSF will rely on vendors

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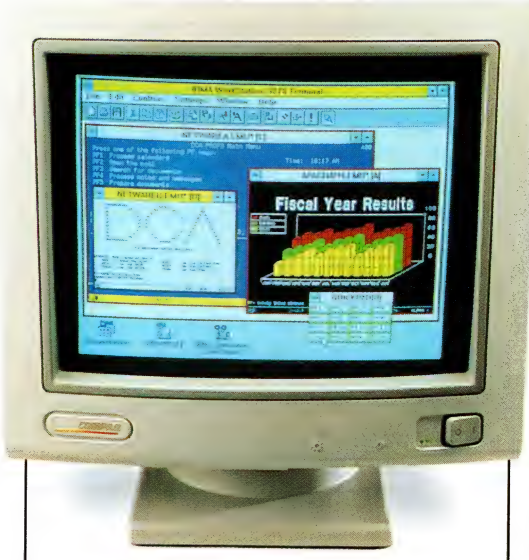

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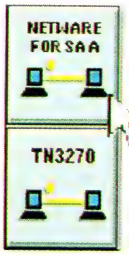

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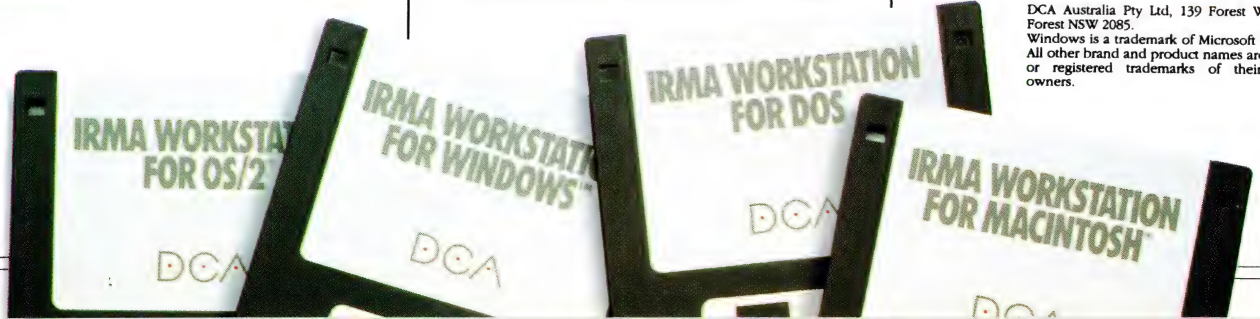


products, those products will develop unique characteristics and mixed-vendor interoperability may diminish. Software vendors will need to ensure that in their eagerness to develop advanced DME applications, they do not compromise interoperation by 'enhancing' the underlying DME application programming interfaces and protocols.

DME Architecture

The central concept of the DME model is that objects interact and co-operate to provide management functions. Anything that is managed by DME is viewed by it as an object. Applications, devices, nodes, links, even its own services, are all viewed as objects. In taking this view, the DME model has extended the OSI approach where a 'managed object' typically represents an abstract view of an external resource, such as an item of communications equipment.

The DME has also extended the manager-agent relationship of the OSI world, where the manager issues management operations and the agent performs those operations on managed objects. In the DME's management model, an object can be a client, requesting services from other objects, and at the same time act as a server providing service to client objects. This client-server model is more dynamic and, in a controlled way, less structured than that of the OSI model. As such, the DME model promises more flexibility, but also demands more of the technology — demands that the DCE and CORBA must meet.

- **Management Request Broker**

Object-to-object communication and interaction in the DME is supported by the Management Request Broker (MRB). The MRB is based on the Object Management Group's CORBA, with extensions added to cater for management needs.

In response to an object's request to initiate communications, the MRB will locate the target object, validate both parties and the request, and manage the object-to-object message flow (see Figure 1 on page 95). As multiple requests arrive, the MRB will provide its services concurrently.

For example, when a client requests service from an object, the MRB must use the object reference provided by the client to locate the object server, irrespective of where it is in the network. The DCE directory service is invoked to do this. The MRB will then invoke DCE security services to authenticate both the client and server objects in each transaction, and ensure the operations requested are authorised. After security validation is complete, operation requests will flow from the client MRB, via the DCE RPC service to the server MRB, which then forwards the requests to the appropriate object server. After the operation is complete the flow is reversed to return results to the client.

- **Naming**

Of course if the MRB is to locate an object, a consistent naming scheme must be adhered to. The DME naming scheme is primarily based on the use of object references, which are used in client programs to point to the target object. They contain the target's location server ID and some other identifying information, such as its community ID or its object server ID. A community in DME is an administrative grouping of related objects and their object servers; for example, a grouping on the basis of site location. So in the process of locating an object, its community server must first be located so that it can resolve the request to one of the object servers that it maintains. DME naming also provides for optional user-friendly names which are intended for human use.

- **Object Server**

The role of object servers within the DME is to enable requested operations to be executed. The client supplies the MRB with an object reference, a requested operation and parameters. The MRB locates the object server, either locally or remotely, and passes the request parameters to it. The object server then locates the object in its local registry and does authorisation checks on the operation. For example, access control will be applied on object create and delete operations, on dynamic inheritance, and on method invocation. Method privileges will be controlled by running under appropriate user-IDs.

If inheritance of an interface is specified, the object server will search for the existing implementation in the network, and retrieve a copy of the implementation code for local activation.

The method to handle the operation request will then be dispatched, either as another thread within the object server process or as a new, separate process. The former approach has performance advantages but may impact overall object server robustness and ease of extension. The converse applies to the latter approach.

As the object server can support concurrent requests, it also provides method and object locking facilities to prevent the corruption that otherwise would occur if two conflicting requests overlap. Object attribute data can be maintained in object server storage objects, which may be implemented as part of the object server or may be external, such as files or databases.

But what of non-DME applications? How can they participate in DME's object oriented framework? One solution proposed for the DME is 'helper' processes. A specific helper process would interface

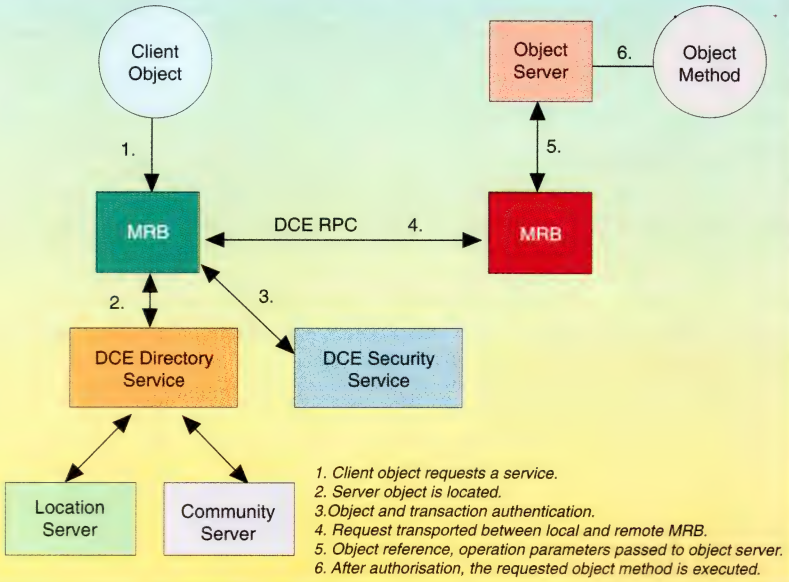
- *Interface* — The interface part of the language defines the syntax and semantics of operations on an object. It describes how and when it may be called, (context, parameters, etc.), its attribute values, what it returns to the caller, what exception conditions can occur, and what notifications can occur. As noted, interface definitions can be considered as an external view, in that they say nothing about how the interface is constructed in software. As such, the interface description is particularly relevant to application developers.
- *Inheritance* — This defines reusability by the object. It describes how the object inherits or reuses implementations of operations from other sources. Inheritance definitions are not abstract but pertain to real software construction and so are most relevant to the object developer. They identify the sources of specific operation implementations, allowing one object to select from and use multiple sources.

For example, consider a software distribution application (object) executing on a DME node. When the operation 'Validate Version Number' is invoked, it may reuse the software implementation from a centralised software distribution system at the network control centre; for the operation 'Download Software' it may reuse the implementation from a software distribution object on the local LAN server; and for the operation 'Reboot' it may use its own specifically developed software implementation.

- *Implementation* — This defines aspects of the implementation, such as the object's internal software structure and attribute data storage requirements. For example, operation implementations may be defined as single or multi-threaded, short or long-lived, one or multiple operations per process. Attribute data, for example, may be computed when referenced, may be stored internally in the DME's B-tree based storage object, or may require storage in an external database. Implementation descriptions are also relevant to the object developer.
- *Instantiation* — Defines the specifics of how instances of the object can be established on various computer operating systems. It covers aspects such as target directories, access control and privileges, and the mapping of object attribute data to real files and databases. It is relevant to network administrators who will be establishing the operational DME in their networks. Aspects of instantiation may be site specific, so there may be multiple instantiation descriptions per implementation, each tailored to a site.

Peter Johnson

Figure 1: Client Invokes a Remote Object Service



building on OSI, and providing solutions to problem areas that have not been effectively addressed by OSI Management, such as sharing management data in a distributed environment, and security.

The DME is not about defining a new set of standards, or even being seen as a definitive implementation of existing standards; it is primarily a software infrastructure, an enabling technology. Consequently, while the benefit of the DME can be predictably stated in 'motherhood' terms — improved service to users by enabling integrated management across all host systems and network nodes — it has another significant benefit. The DME will make it easy and attractive for vendors to enter the management application market and compete. For users this promises more choice and contained costs.

DME Technology

Underlying the vision of the DME are the principles of scalability, consistency and interoperability. The scalability principle means that the DME should apply uniformly from a small LAN through to a large enterprise network. Scalability will be achieved by allowing DME services to be located anywhere in the network, with connectivity to those services based on the services of the DCE. This distribution of services means you can add DME processing power and capability when and where you need it. For example, user views of a distributed network could be established for branch offices, regional offices and the central office — with management data being selectively filtered as is moved up the hierarchy.

The DME's consistency arises from the object-based model that it applies to managed entities. The characteristics of systems entities like users, application processes and peripheral devices will often be quite different from network entities like links, ports and nodes.

Systems management will typically involve complex relationships among processes, file systems, directories, timing and security controls, while network management will typically involve monitoring, polling and event handling. The DME handles these differing requirements in a consistent way by adopting a single object model applicable to all management entities, and by providing corresponding services and functions that hide the diversity of those entities.

Consistency is also provided in the way the user interacts with the DME. A graphical management user interface (MUI) is available for use by DME applications, to define and control the way that menus, lists, icons and maps are handled. Of course this is only what we would expect these days — no one wants to learn new mouse or keyboard skills with each new application.

The principle of interoperability is addressed by clearly specifying the protocols and application programming interfaces needed for interoperation. The OSF's DCE has a fundamental role here, with the DME depending on the DCE's Remote Procedure Call (RPC), Directory Service, Time Service and Security Service. However in the drive for interoperability, the OSF has been eager to take advantage of other official and de facto standards such as SNMP, CMIP, the X/Open Management Protocol (XMP), and the Common Object Request Broker Architecture (CORBA).

We could note here that while a base level of interoperability is delivered with the licensed DME source code, as vendors add value to their management application

DME's Object Oriented World

Object orientation is fundamental to the DME concept of building management solutions from distributed, co-operating objects. So a major challenge for the OSF is to provide a simple yet powerful object framework which enables all objects to be defined and interact in a consistent way.

The OSF's approach is to take full advantage of the object model as defined by the Object Management Group's CORBA specification, extending it somewhat to suit management requirements, while retaining base compatibility with CORBA. In DME, objects can be considered as belonging to one of three categories:

- *Management Objects* provide a particular management service, and may also request services from other objects. Some of these management objects are effectively full applications, consolidating the more basic services offered by other objects;
- *Presentation Objects* provide services for interacting with a graphical display; and
- *Adaptor Objects* provide access to the non-DME world. For example, to exchange information across the DME boundary, whether using a management protocol like SNMP or CMIP, using RPC calls to a database server, or accessing a file system, an adaptor object will provide the service.

Adaptor objects are DME's mechanism for bringing existing management systems, APIs and protocols into the DME domain. On the DME side, adaptor objects conform to DME's object model; on the non-DME side, they utilise the specific interface and protocol of the target system or device. The adaptor object does the semantic and syntactic mapping between the two sides.

What's in an Object?

Apart from category, DME objects are classified according to type. For example, an object of type 'file' would be similar to other 'file' objects but generally dissimilar to type 'network-device.' Type therefore is simply a way of grouping objects with similar properties.

Types can be arranged in a hierarchy, from general down to most specific. Types lower in the hierarchy, called subtypes, will refine characteristics and properties of the higher types. For example, the type 'network-device' may have subtypes including 'bridge,' 'router,' 'hub,' and 'terminal server.' The type 'router' may then have subtypes of 'hardware router' and 'software router.' Each DME type is uniquely identified and is precisely defined by the interfaces it offers.

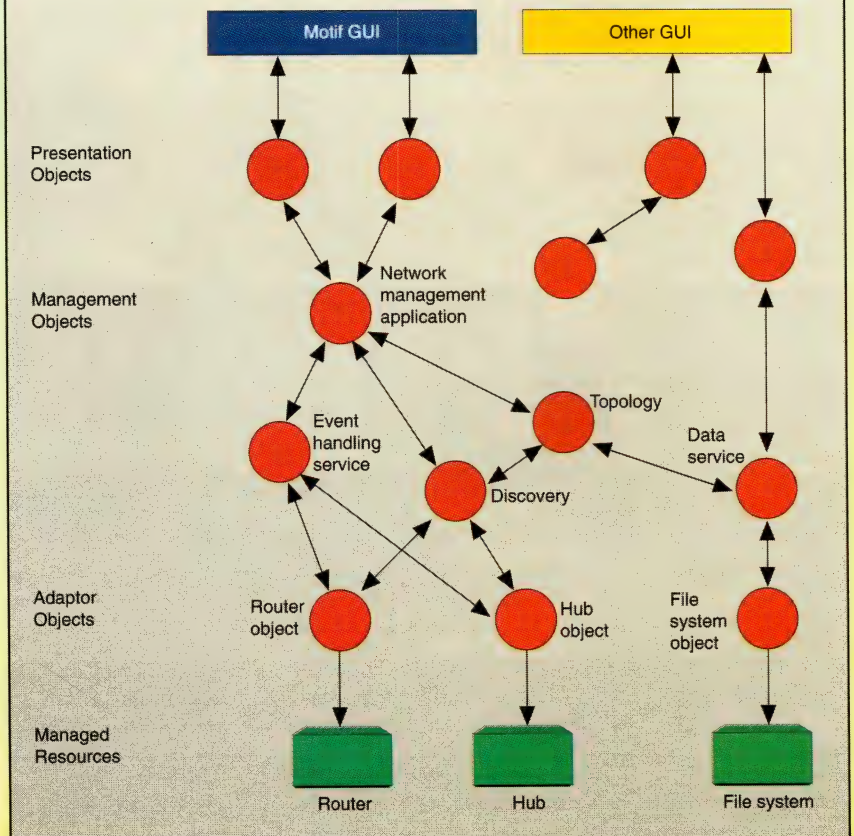
An interface presents an external view of the object and effectively describes how an application developer might utilise that object. Each interface in DME is uniquely identified and defined in terms of the specific operations that can be requested, the parameters required and the results returned, including possible exceptions. The definition will also detail any event notifications that the interface may emit, independently of any invocation of the interface.

So we can regard an object, in concept, as a collection of interfaces. However, because objects exist over time and because invocations have consequences, we also need to take into account an object's state. Clearly an invocation of an object's 'start/stop' operation with the controlling parameter set to START will change the object's state if it was previously STOPPED. An object's state can be represented as a set of internal attributes, which are accessed or changed by interface operations.

DME allows different types of objects to support a common interface and behave similarly in regards to that interface, a characteristic termed *allomorphism*. For example, if a printer object and a terminal-server object both support a common operator interface, the operation 'Place Offline' would in each case make those objects unavailable for service to users.

To facilitate subtyping, DME object servers will support inheritance, or automatic reuse, of interface definitions. Such reuse is seen as one of the major opportunities for increasing productivity in the development of management applications. Nevertheless, encapsulation and the emphasis on interfaces means that defining a type does not mandate any specific implementation approach. The internals of an object are hidden, and how an object is built is up to the developer.

In the DME, management solutions are comprised of distributed objects interacting and co-operating.



Describing Objects

DME provides a formal language to allow developers and administrators to specify objects. The OSF plans to develop a compiler that will process the language definitions and produce stubs to be included by client programs, sets of function prototypes to guide developers, and scripts for administrators to create entries in the site's DME repository of object details. The language covers the four key aspects of object specification:

Deciphering the DME Enigma

The OSF's Distributed Management Environment promises to provide a consistent management solution for networks of diverse, heterogeneous systems. Peter Johnson examines its approach.

When plans for the Distributed Management Environment (DME) were announced two years ago, it seemed that DME was to be an overnight success — at least in terms of vendor support and interest from the networking community. Today, over a third of Australian network managers see DME as their strategic direction for systems and network management, according to ATUG's Network Management Study.

But despite this widespread support, DME remains an enigma, both in terms of its technology and its position in the marketplace. Questions arise about what DME is — What is it comprised of? Is it a standard? Is it an OSI Management alternative? Is it a product? Will it be the unifying force in network management? Most importantly, as a network manager could you adopt it with confidence as your strategic management solution?

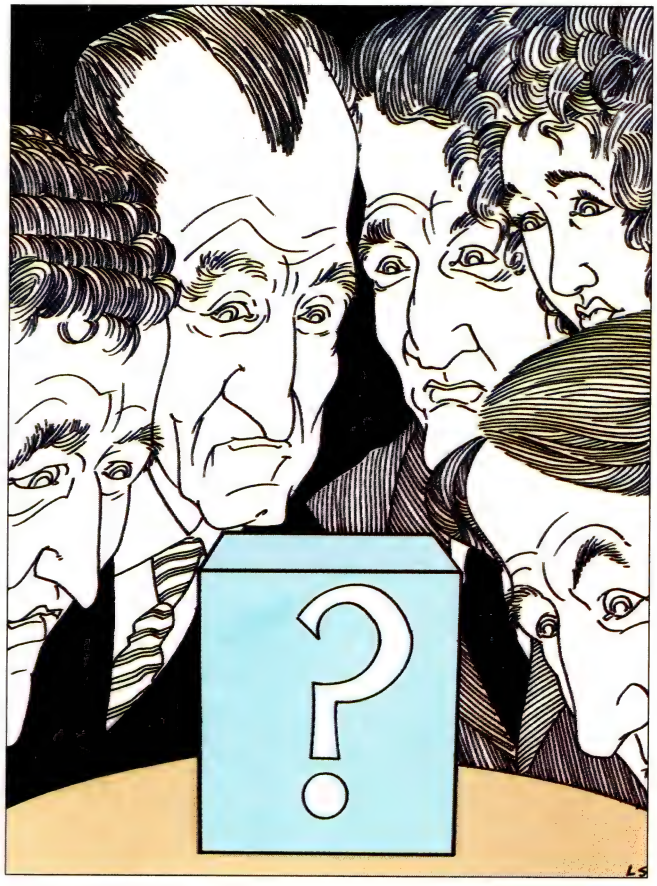
What is the DME?

To set the scene, it's worth taking a look at DME's originator, the Open Software Foundation (OSF). OSF began as a consortium of vendors (including Digital, Hewlett-Packard, and IBM) formed to develop an 'open' Unix, the OSF/1 operating system. From there, the OSF moved on to the OSF/Motif graphical user interface, and then to the Distributed Computing Environment (DCE), which provides a software framework for developing and operating distributed applications in a network of different vendor platforms.

The OSF's *modus operandi* is to prepare and issue requests for technology, to which any vendor can respond, in full or part. The OSF selects components of the technology offered and uses its own or external resources to integrate and where necessary develop those components. It then licenses the resulting software to its members for porting to their own platforms. Input to the preparation of the requests for technology and to the subsequent selection process comes from OSF staff, from OSF member companies via the special interest groups, and from industry consultants.

The OSF initiated the DME as a natural and necessary follow-on to the Distributed Computing Environment. For DCE to succeed, and for distributed applications to be widely adopted, the OSF recognised that systems and network management would be necessary. So the objectives of the DME are to provide:

- An architecture that defines a consistent management approach for networks of diverse, heterogeneous systems; and
- A suite of software that implements aspects of that architecture. This software provides a set of foundation services, ready to support management applications developed by others.



The key differentiator in the above objectives is the latter one. One could argue that OSI Management provides an architecture and standards for consistent management of open systems. In fact, in selecting technologies for the DME, OSF drew heavily on OSI Management concepts and on official and de facto standards.

But the OSF takes the process a vital step closer to commercial reality — it delivers real software. So we should not regard the DME as an OSI Management alternative. Rather we can see it as

Should you buy a hub that suits your present needs, or should you plan for the future? Yes.

Start simple.

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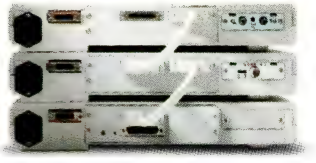

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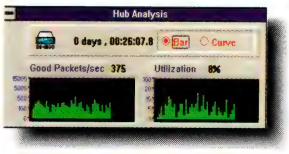

▲D-View SNMP network management program

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like the Civil Aviation Authority have a say (mainly because they are allowed to by-pass the regulations).

No-one ever mentions the role that the Defence Department plays here, but obviously it must have a very substantial impact because of its sheer weight, and the fact that it now has a policy of harmonising defence standards with civilian standards in order to cut costs.

Austel has taken over the key standards-setting role here from Telecom. Australia, like most countries in the world, has had its suite of domestic telecommunications standards defined by its dominant carrier for the last hundred years, but in recent years with deregulation and competition, the situation has changed.

The tzar of telecommunications standards in Australia is obviously Austel's Dr Bob Horton. Bob Horton is the chairman of Austel's Standards Advisory Committee and the chairman of the Australian Telecommunications Standardisation Committee (ATSC), and recently he became chairman of the Telecommunications Standards Advisory Group within the ITU. So we have a heavyweight on the committee that matters the most.

Australia's input to ITU-T standardisation is managed by Austel through this Australian Telecommunications Standardisation Committee, which has a broad membership (similar to the locally oriented Standards Advisory Committee). At the working level it has 15 national study groups which mirror the international group structure.

The ATSC also has direct relationships with the various regional standards bodies: ETSI in Europe, the T1 committee in North America, and the TTC in Japan. "We participate with those bodies, and with Canada and Korea, through the Inter-regional Telecommunications Standardisation Conference (ITSC)," explains Horton. "Austel also has a watching-brief over more specific technical standards, as with the Asian ISDN Council."

"Also on a regional basis is the department's initiatives within the Asia/Pacific Economic Co-operation (APEC) forum. APEC has an interest in the 'harmonisation' of methodology — to allow the region to begin working together towards international standards."

But there are often clear advantages to sectors of Australian industry when the nation diverges from recognised standards. Back in the Whitlam years AWA almost persuaded the government to use FM radio frequencies unique to this country. This could have been a bonanza for our struggling radio manufacturing industry, which died soon after — either that, or it could have completely destroyed the incipient FM radio broadcasting industry because everyone was buying Japanese transistors anyway. And this is the problem; non-standard standards are always a two-edged sword.

"If Austel, for whatever reason, sets a standard which diverges from an overseas one, this could have clear competition implications. Both exports and imports would be made more difficult because products would have to be re-engineered," argues Sheila McGregor.

"Early last year Australia acceded to the GATT Agreement on Technical Barriers to Trade, known as the Standards Code. This code, by regulating procedures and systems relating to standards, testing and certification, aims to reduce unnecessary technical barriers to international trade, thus promoting both imports and exports," McGregor explains. "While improving access to world markets for Australian exports facing restrictive standards, [membership] also creates obligations not to discriminate against imported goods, or create unnecessary technical obstacles to international trade."

Stewart Fist is a freelance journalist based in Lindfield (NSW).

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ITU Electronic Documents

An interactive interface to the International Telecommunication Union's ITUDOC system is available through the TIES (Telecom Information Exchange Services) virtual terminal (VT) interface. TIES can be accessed via:

Direct dial-up: +41 22 733 7575; or
X.25: 2284681 11112; or
Telenet (Internet): ties.itu.ch (156.106.4.75); or chi.itu.ch (156.106.4.16)

The communications setup should be anything from 300 to 9,600bps, 8 data bits, no parity, and there is V.42, V.42*bis*, MNP support. VT100 minimum terminal capability is required, while VT200 or greater capability is preferred. You should logon as GUEST or ANONYMOUS for access to TIES public services. For access to other services, registration is necessary. (Information about TIES and other services is available in the ITU Document Store in the group /TIES.)
The interactive interface is easy to use and menu-driven: you can browse up and down the hierarchical tree of the ITU Document Store. You can view documents and mark selected documents for retrieval. You can then transfer documents to your remote site using one of the following methods: KERMIT; INTERNET FTP (File Transfer Protocol); REFLECTION Terminal Emulation WRQ PROTOCOL; EMAIL (ASCII documents - RFC-822 (SMTP) or TIES e-mail address required).
When you are looking for a standard, or any other document, you cannot retrieve it just by its 'name' — you must use its UPI (Unique Permanent Identifier). The UPI number of the document you are looking for can be found with the LIST command. For example, before you can ask for Rec. X.402, you must first find the UPI through the command: LIST ITU-T\REC\X to list the X-Series Recommendations. (The UPI for this document is ITU-5210). Then, to get a Winword 2.0 version of Rec. X.402, you will type: GET ITU-5210 (not GET X.402).
You may ask questions by inserting the command HUMAN in your message. The text following the HUMAN statement (in the body part of your message) is forwarded to an operator. If your questions concern the ITU-T, you can send them directly itu.ch.

For further assistance or information contact: Fernando Lagrana, ITU-T Bureau Editor, Electronic Document Handling; itu.ch. Tel: + 41 22 730 58 94; Fax: + 41 22 730 58 53; X.400: SURNAME=lagrana, PRIVATE_DOMAIN=itu, ADMIN_DOMAIN=arcom, COUNTRY=ch.
The AutoMAGIC mailbox also has a new address on Internet: it's now: itu.ch.

Its aim appears to be to control and establish pan-European standards in a way which, admittedly, has some beneficial aspects in the moves towards globalisation — but in fact, encourages European manufacturers to use their coordinated muscle against competitors in the US and the Orient.

They are not alone in this gamesmanship; ANSI and the other American organisations have long held the US market largely to themselves by failing to comply with international standards, and creating their own. They've had the muscle power to do this in the past because the North Americans owned around half the world's telephones until recently, and now they own a third. A national American standard under ANSI is effectively a regional standard on a level with ETSI.

The Europeans call their efforts 'world standards' and often claim that they are 'open.' But this often means a 'theoretical' openness, not a practical one: most of the essential patents and most of the chip manufacture will be locked up by associated European companies — so you can only build equipment to these open standards if you can afford to pay the price.

With GSM, for instance, the open standard has become a regional patent cartel. Motorola and NorTel are included here because they hold key patents, and they can also provide a reciprocal entry into some parts of the North American market. "Standards have the capacity both to promote and to hinder competition and they can do this in lots of ways," says Sheila McGregor — and she's not far wrong.

Fortunately, in recent years, ANSI and the IEEE have begun to take a more international perspective, and the globalisation of telecoms is beginning to wean power away from regional organisations — except in the radio-telephone, paging, mobile data and satellite technologies, where regional interests dominate.

There have been calls by the ITU and others for the establishment of an Asian body along ETSI lines. Australia and New Zealand already have a cooperative organisation (SANZ — Standards Australia and New Zealand), and a Joint Accreditation Scheme, which are part of the Closer Economic Relations (CER) arrangement.

However, "In Australia's interests, we fundamentally seek to support the pre-eminence of international, rather than regional standards; this is where Australia's future lies," says Dr Bob Horton of Austel. "We are not part of any regional body at this stage except for associate memberships. Australia's best interests are in global standards with the ITU."

In other words, Australian manufacturers feel that it is more important to keep aligned with the global changes, than to try to gain advantage from regional developments — since not much is likely to come out of this region anyway.

However Austel is a member of the Asia-Pacific Telecommunity (APT). A couple of years ago the APT conducted a survey of the regional regulators to ascertain the need for standardised testing procedures in Asia, and to find what would be involved in each of us recognising each other's equipment accreditation procedures. If it was licensed to be attached to the network in Korea, could it be automatically licensed in Australia? The process is still proceeding: "[The survey] was responded to by 24 countries and it gave us a catalogue of all the requirements," says Austel's Rex Christensen. "We are trying to push the agenda ahead to regional centres for testing-excellence, next."

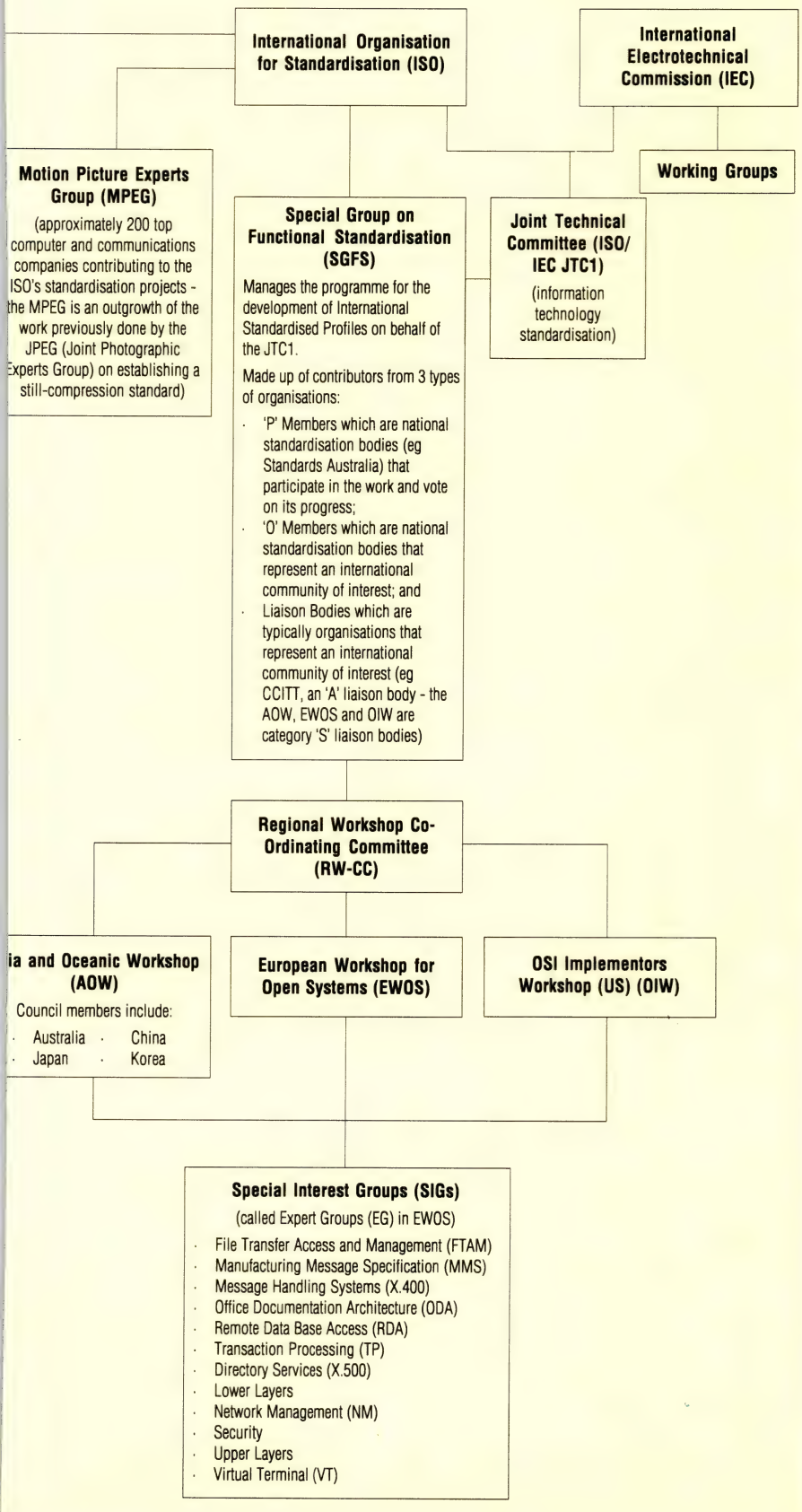
They hope that reciprocal recognition of both the test houses and the tests, will help avoid multiple testing, so decreasing both costs and delays in getting product to market in the region. So it is a small, but viable beginning to establishing a regional trading bloc of our own.

Austel's Standards Development Process

- Suggestions for new standards (or amendments) come from a number of bodies — the Standards Advisory Committee; industry; a carrier; or users (via a ministerial direction); and also from government policy.
- The SAC (Standards Advisory Committee) makes a recommendation and produces terms of reference.
- Austel then feeds this reference to an existing working group, or it may establish a new working group. The chairman of a new group is appointed by the SAC.
- The working group produces the draft standard — they tend to limit themselves to strictly technical matters, using Austel's staff services for matters like cost considerations, etc. Austel attempts to accommodate different views by having balanced representation on its working groups, and it allows both the majority and the minority view to go forward to the Standards Advisory Committee for consideration.
- When completed, the draft is first referred to the SAC who check it and decide whether it should go out for public comment (if so, it will be referred to Standards Australia for printing and public sale).
- The public review process takes sixty days, and in parallel, the Office of Legislative Drafting begins writing the document as Parliamentary legislation. It will also register and maintain a public-access database
- Austel may also decide to hold public seminars for complex standards and significant changes.
- All comments from the public review process are passed back to the working group, and the draft may be adjusted appropriately.
- The Standards Advisory Committee will then check the draft again, and, if satisfied, recommend it to Austel.
- It is then considered by Austel's board before being passed to the Minister and the legislative draftsmen. It will then be gazetted, tabled in Parliament, and finally released for sale.

National Standards

In Australia there only two standards bodies that really matter — Standards Australia, and Austel — although other organisations



From page 82

The main changes being made here are to speed up the process by improving working methods and procedures. They also recognise the need to streamline study group structures, eliminate overlapping, and play more of a role in harmonising the activities of other national and international groups.

Within this Standardisation Sector there will be a World Telecommunications Standardisation Conference (replacing the Plenaries) supported by study groups; an advisory group on standardisation (setting priorities and strategies); and a Standardisation Bureau headed by a Director (equivalent to the old CCITT Secretariat).

An accelerated procedure for the approval of 'Recommendations' has already been adopted, so future World Conferences will be able to spend more time on policy issues, planning and setting priorities. Work programs for the working groups will be updated annually now, rather than over four years under the previous structure. A lot more emphasis is being placed on communicating with the world at large through electronic information on-line systems: Welcome to the 21st Century!

- **Radiocommunications**

This bureau will now include what remains of the CCIR activities, along with the spectrum allocation role of the IFRB — so this sector is devoted more to regulation than standardisation. Obviously they are now recognising that radio links will play a much more important role in telecommunications in the future, and also of the role that will be played by satellites.

A group of experts is already examining ways to simplify radio regulation procedures, and they are considering new ways of allocating the spectrum. It is well recognised that these processes have been piecemeal, and proved impossibly complex with the rapidly changing environment. As a result World Radiocommunications Conferences will now meet every two years.

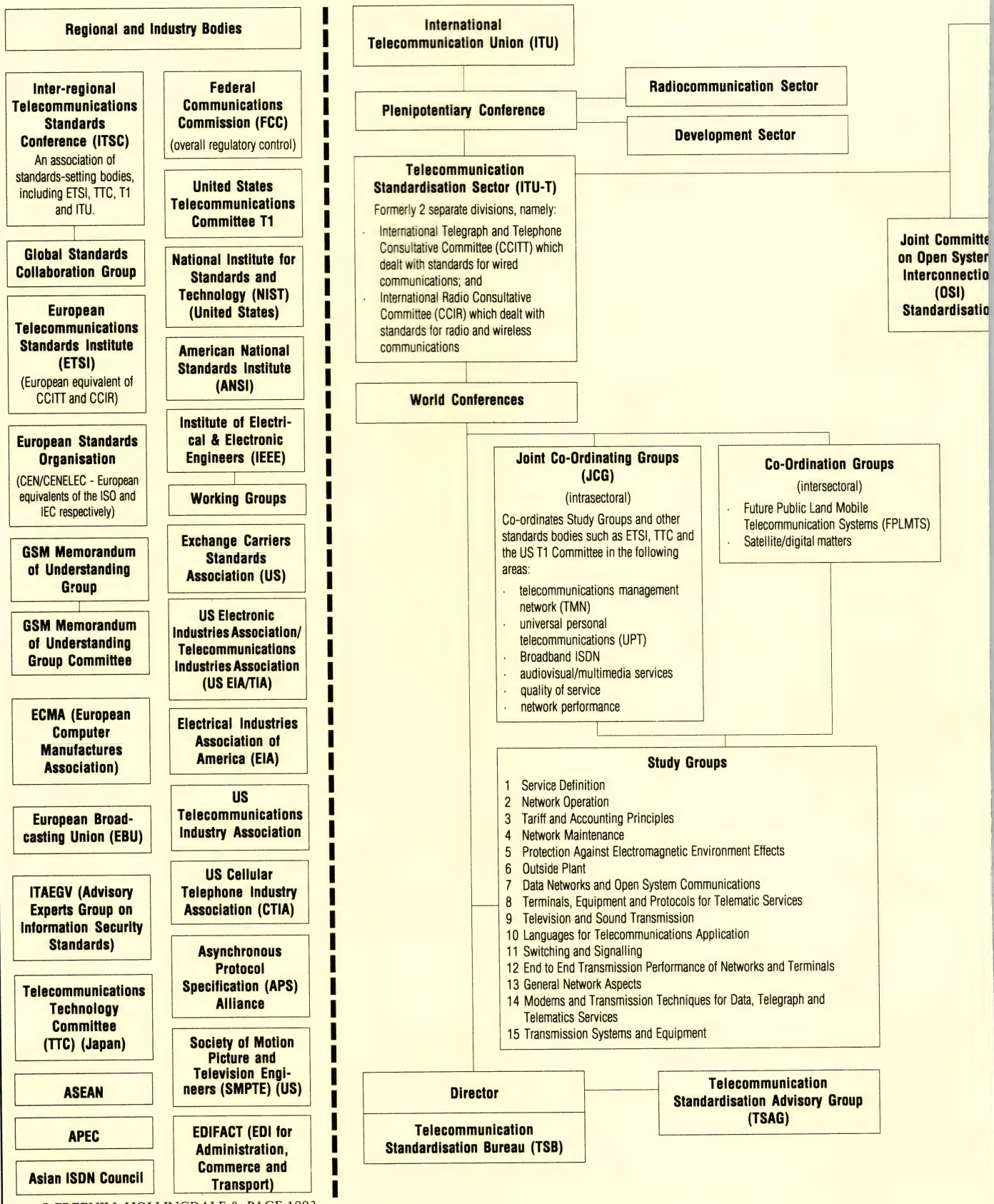
The Regional Bodies

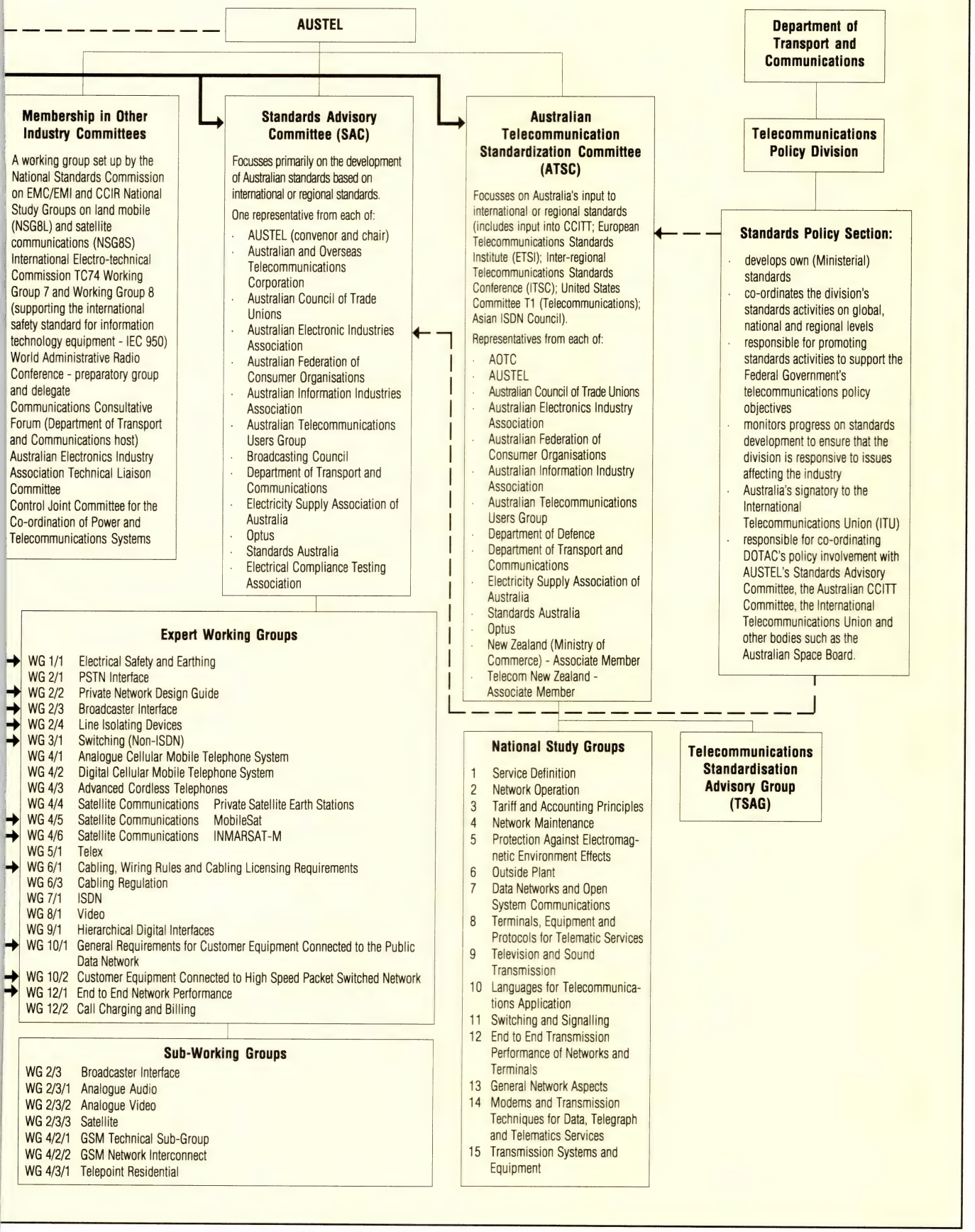
Standards-making at the regional level has noticeably different characteristics to that of the international forums — and it is often driven by quite different motivations.

Everyone agrees that regional standards organisations are playing a major part in re-establishing the power of regional trading blocs. As the GATT talks move the world closer to free-trade in terms of reduced tariffs, the importance of setting and maintaining control of standards becomes increasingly important as a way of gaining regional manufacturing advantage. Standards can play a role in controlling technology imports in the way that tariffs and excises do with more conventional goods.

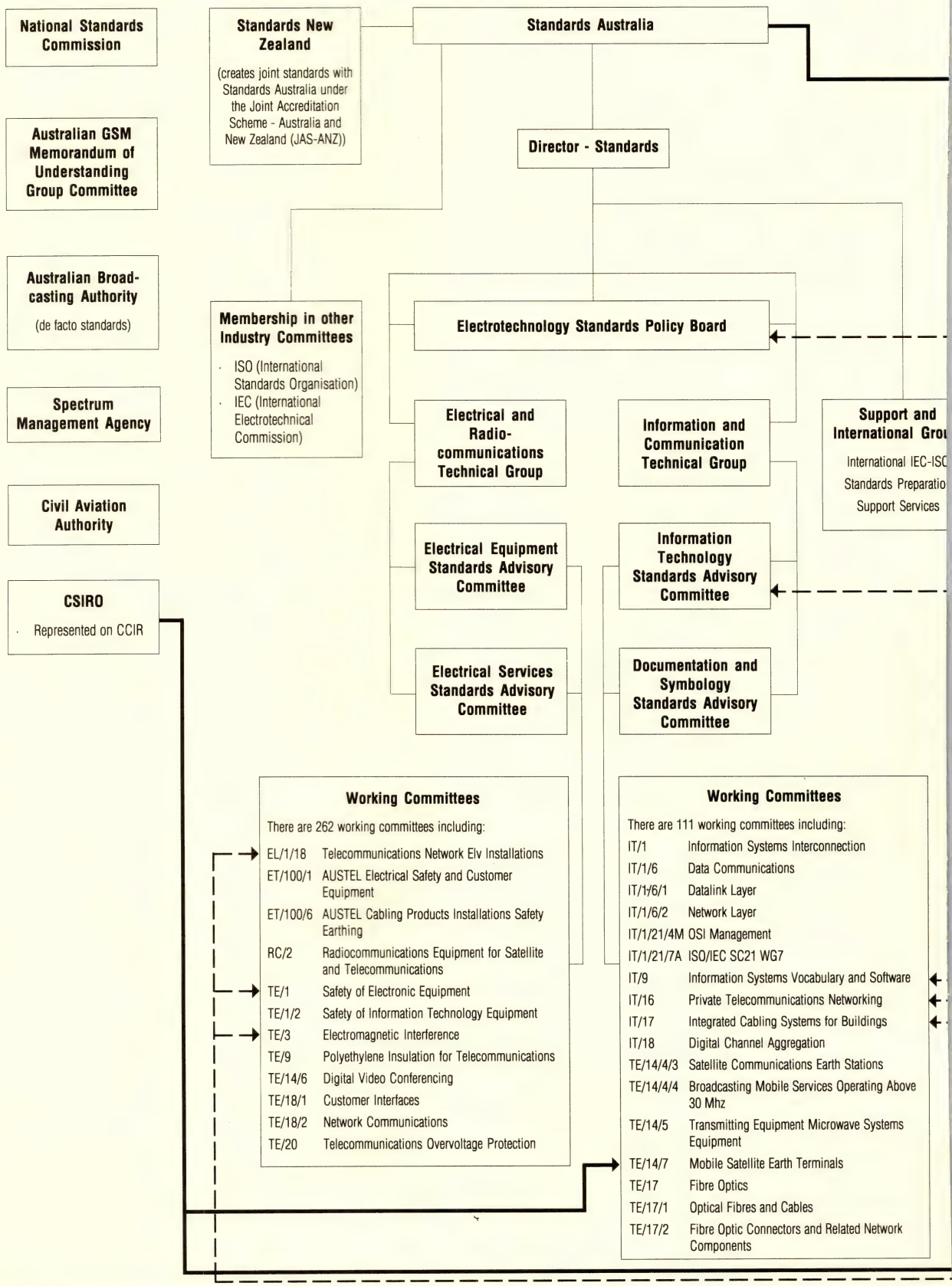
ETSI, for instance, takes a strong regional trade-bloc perspective on standards.

Telecommunications Standards Organisations — International and Regional




AUSTEL
Department of Transport and Communications
Telecommunications Policy Division
Membership in Other Industry Committees
A working group set up by the National Standards Commission on EMC/EMI and CCIR National Study Groups on land mobile (NSG8L) and satellite communications (NSG8S)
International Electro-technical Commission TC74 Working Group 7 and Working Group 8 (supporting the international safety standard for information technology equipment - IEC 950)
World Administrative Radio Conference - preparatory group and delegate
Communications Consultative Forum (Department of Transport and Communications host)
Australian Electronics Industry Association Technical Liaison Committee
Control Joint Committee for the Co-ordination of Power and Telecommunications Systems
Standards Advisory Committee (SAC)
Focusses primarily on the development of Australian standards based on international or regional standards.
One representative from each of:
AUSTEL (convenor and chair)
Australian and Overseas Telecommunications Corporation
Australian Council of Trade Unions
Australian Electronic Industries Association
Australian Federation of Consumer Organisations
Australian Information Industries Association
Australian Telecommunications Users Group
Broadcasting Council
Department of Transport and Communications
Electricity Supply Association of Australia
Optus
Standards Australia
Electrical Compliance Testing Association
Australian Telecommunication Standardization Committee (ATSC)
Focusses on Australia's input to international or regional standards (includes input into CCITT; European Telecommunications Standards Institute (ETSI); Inter-regional Telecommunications Standards Conference (ITSC); United States Committee T1 (Telecommunications); Asian ISDN Council).
Representatives from each of:
AOTC
AUSTEL
Australian Council of Trade Unions
Australian Electronics Industry Association
Australian Federation of Consumer Organisations
Australian Information Industry Association
Australian Telecommunications Users Group
Department of Defence
Department of Transport and Communications
Electricity Supply Association of Australia
Standards Australia
Optus
New Zealand (Ministry of Commerce) - Associate Member
Telecom New Zealand - Associate Member
Standards Policy Section:
develops own (Ministerial) standards
co-ordinates the division's standards activities on global, national and regional levels
responsible for promoting standards activities to support the Federal Government's telecommunications policy objectives
monitors progress on standards development to ensure that the division is responsive to issues affecting the industry
Australia's signatory to the International Telecommunications Union (ITU)
responsible for co-ordinating DOTAC's policy involvement with AUSTEL's Standards Advisory Committee, the Australian CCITT Committee, the International Telecommunications Union and other bodies such as the Australian Space Board.
Expert Working Groups
WG 1/1 Electrical Safety and Earthing
WG 2/1 PSTN Interface
WG 2/2 Private Network Design Guide
WG 2/3 Broadcaster Interface
WG 2/4 Line Isolating Devices
WG 3/1 Switching (Non-ISDN)
WG 4/1 Analogue Cellular Mobile Telephone System
WG 4/2 Digital Cellular Mobile Telephone System
WG 4/3 Advanced Cordless Telephones
WG 4/4 Satellite Communications Private Satellite Earth Stations
WG 4/5 Satellite Communications MobileSat
WG 4/6 Satellite Communications INMARSAT-M
WG 5/1 Telex
WG 6/1 Cabling, Wiring Rules and Cabling Licensing Requirements
WG 6/3 Cabling Regulation
WG 7/1 ISDN
WG 8/1 Video
WG 9/1 Hierarchical Digital Interfaces
WG 10/1 General Requirements for Customer Equipment Connected to the Public Data Network
WG 10/2 Customer Equipment Connected to High Speed Packet Switched Network
WG 12/1 End to End Network Performance
WG 12/2 Call Charging and Billing
Sub-Working Groups
WG 2/3 Broadcaster Interface
WG 2/3/1 Analogue Audio
WG 2/3/2 Analogue Video
WG 2/3/3 Satellite
WG 4/2/1 GSM Technical Sub-Group
WG 4/2/2 GSM Network Interconnect
WG 4/3/1 Telepoint Residential
National Study Groups
1 Service Definition
2 Network Operation
3 Tariff and Accounting Principles
4 Network Maintenance
5 Protection Against Electromagnetic Environment Effects
6 Outside Plant
7 Data Networks and Open System Communications
8 Terminals, Equipment and Protocols for Telematic Services
9 Television and Sound Transmission
10 Languages for Telecommunications Application
11 Switching and Signalling
12 End to End Transmission Performance of Networks and Terminals
13 General Network Aspects
14 Modems and Transmission Techniques for Data, Telegraph and Telematics Services
15 Transmission Systems and Equipment
Telecommunications Standardisation Advisory Group (TSAG)

Telecommunications Standards Organisations — Australia



Who is an *Australian Communications* Reader?

- There's a better than even chance that he works for a company of with over 500 employees
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- There's a 70% chance that he's running Windows or will be in the next 12 months
- And there's an almost 80% chance that he prefers *Australian Communications* for depth of information and value to him in his job to any other Australian IT publication.

And there are 26,500 more just like him who read *Australian Communications* every month. Maybe you should be talking to him!

***All statistics are based on the response to the August 1993 *Australian Communications* readership survey conducted by Price Waterhouse, and *Australian Communications'* ABC Audited Paid Circulation.**

For a copy of the complete survey results please contact Craig Burkill or Dawn Switzer on (02) 264 2200.

Price Waterhouse

Fortunately, the work of ISO is generally farmed out to other organisations: for instance, ANSI has responsibility for about 16 technical committees, 60 subcommittees and 190 working groups.

The IEC

Also closely related to telecommunications, but also with no official standing at the UN, is the much older IEC or International Electro-technical Commission (founded in 1906), which deals with electrical safety, electrical standards, and radio interference problems in telecommunications.

Then just to confuse you, there's a Joint Technical Committee No.1 (JTC1) which is hopefully able to blend the considerations of the ISO and IEC, and they often work with the ITU by publishing joint papers. They also work together more formally both at the top level, and with the separate subsections.

For instance, the IEC is jointly engaged with the International Working Party of the ITU (ex-CCIR's Interim Working Party IWP/11/9) and the ISO in the development of High Definition TV standards for VCRs and optical recorders. Also involved in this effort are other groups from the old CCITT, and the joint CCIR/CCITT Study Group on television and sound transmission. It must become pretty complicated trying to work out who's area of responsibility some of these developments are.

The ITU

According to the official literature, the ITU is a United Nations body with about 160 member countries; which is a bit odd when you think about it, since the ITU is a treaty body which was formed in 1865, eighty years before the UN was even a twinkle in President Roosevelt's eye.

It is an inter-governmental organisation whose members are states, but it directly services a wide range of interests. There are several levels of membership from that of the US State Department, down. According to a recent internal review, the ITU family has 'traditionally been composed of National Telecommunications Administrations, Recognised Private Operating Agencies (RPOAs), and Scientific or Industrial Organisations (SIOs).' Non-Member participants make a major contribution to its work.

The 'family' is now growing under the pressures of deregulation to include 'private-sector commercial operating agencies, business users and other groups representing specialised users, multilateral and regional telecommunications operating agencies, regional and national broadcasting organisations, and international, regional and bilateral development and financial institutions.' It looks like anyone who can make it to Geneva for their holidays will find tax-deductable accommodation at ITU headquarters.

The CCITT Becomes the ITU-T

The CCITT has been replaced by the Telecommunication Standardisation Sector of the ITU, with the acronym ITU-T (and not ITU-TS or TSS).The ITU-TS acronym was used for a few months, but is now out of date.

The CCITT Specialised Secretariat has been replaced by the Telecommunication Standardisation Bureau (TSB), and the CCITT Plenary Assembly has been replaced by the World Telecommunication Standardisation Conference (WTSC).

The Recommendations (now developed by the ITU-T), are referenced as ITU-T Recommendations. For example, CCITT Recommendation X.500 now becomes Recommendation ITU-T X.500. Other changes are (with some examples):

THE OLD CCITT	THE NEW ITU-T
CCITT Plenary Assembly	WTSC
CCITT Study Groups	ITU-T Study Groups
CCITT Study Group VII	ITU-T Study Group 7
CCITT Resolution No. 1	WTSC Resolution No. 1
CCITT Recommendations	ITU-T Recommendations
CCITT X-series Recommendations	ITU-T X-series Recommendations
CCITT Recommendation X.400	Recommendation ITU-T X.400
CCITT Secretariat	TSB
Director of the CCITT	Director of the TSB
CCITT Circular No. 1	TSB Circular 1
CCITT Collective-letter No. 1/VI	TSB Collective-letter 1/6

There is something that's quaintly 'Edwardian-bureaucrat' about the language of the ITU with its 'Rapporteurs' and 'Recommendations', and its 'Plenipotentiary' (I always imagine an Arabian Nights meeting complete with belly-dancers!) or 'Plenary' conferences which meet every four years to 'ratify' proposals (which are, by then, usually firmly ensconced in silicon). Until now, it has moved at a leisurely Edwardian pace.

Mind you, there's a lot of work involved. The CCITT standards which decorated the shelves of the rich and famous were identified in colours: Red (1960), Blue (1964), White (1968), Green (1972), Orange (1976), Yellow (1980), Red again (1984), Blue (1988), White etc. (1992) — and by 1988, just the Blue Books were occupying 1.5 metres of shelf-space.

However 1993 is a time of upheaval for the ITU; it is trying to reform is processes with 'fast-tracking' so that standards-making doesn't take 10 years — when the average market-life of the technology is only 10 months. And it is completely revamping the whole organisational structure.

Under the old regime it had four divisions: a General Secretariat, the IFRB (International Frequency Registration Board) which managed the allocation of satellite and radio frequencies, the CCIR (Comité Consultatif International des Radiocommunications) which set standards for radio, and the CCITT (Comité Consultatif International Télégraphique et Téléphonique) for telecommunications.

In future there will be three Sectors (each with its own Director and Secretariat) under the leadership of the ITU's Secretary-General. These sectors (now to be called 'bureaus') will have their own members, advisory board, study and working groups, and conference.

- **Development**

This bureau would include the Telecommunications Development Bureau (BDT) together with the functions planned for the Centre for Telecommunications Development (CTD). The integrated activities of this sector are mainly directed towards mobilising resources for development of telecommunications in the less-developed regions of the globe — including 'the establishment of favourable lines of bank-credit.'

This is a sticky point with many of the older OECD Members, and they felt quite keenly that they've been steam-rolled by India and the third-world countries into expanding this area of telecommunications in a way that involves financial and political considerations more than technical. Australia was fairly vocal in its opposition to many of these development proposals.

- **Standardisation**

This bureau is to include all the standardisation activities of the old CCITT and some of the CCIR. Its name has changed twice; from ITU-TS (Telecommunications Standardisation) to ITU-T, some time in the last few months, for some unexplained reason.

Continued on page 87

ETSI — Is the European Telecommunications Standards Institute, the standards-setting body within CEPT (which it has largely consumed) since 1988. ETSI is now the European standards organisation in control of the development of ISDN, B-ISDN, MANs, DECT, GSM, PCN and UMTS. It has a General Assembly, a Technical Assembly, 12 Technical Committees and 5 Special Committees. Most of the detailed work is done by 60 Sub-Technical Committees.

EWOS — The European Workshop on Open Systems is the European version of the OSI Workshop in the US; it exists under the CEN banner. It is involved in conformance testing, e-mail standards (X.400 and X.500) and the elements of OSI. It has ETCOM (European Testing for Certification of Office and Manufacturing) and publishes ETGs (EWOS Technical Guides).

FED-STD — Federal Government Standards. There are a number of FED STD standards for modems, and general communications. They are usually designated by a four-digit identifier (FED-STD ####). See FIPS also.

FCC — The US Federal Communications Commission regulates and monitors the US domestic use of the electromagnetic spectrum for communications. Since 1934 it has been the authority which regulates all interstate and international telecommunications in the US. It has a board of commissioners appointed by the President. Although it does not create standards itself, the FCC forces and directs standards issues in the US; and because of its political strength it acts as a regional regulator.

FIPS — Federal Information Processing Standards. The American Government organisation (under the NBS — the National Bureau of Standards) which sets the GOSIP (Government OSI Procurement) standards. It publishes standards designated as FIPS #-#.

IAB — The Internet Architecture Board, which controls TCP/IP development.

IEEE — Founded in 1963, the Institute of Electrical and Electronic Engineers is one of the oldest and most respected professional societies in the US. It is a membership organisation with engineers, scientists and students — and membership (300,000-strong) is global.
The Computer and Communications Societies within the IEEE have concentrated recently on defining standards in electronics and information technology — with particular emphasis on local area and wide area network standards. Its best-known standards are the IEEE 488 instrument bus, and the '802-dot' series for local area networks. Many of these standards have been taken up as ISO standards (i.e. the IEEE 802.3 is the same as ISO 8023.)

ISO — Either the International Standards Organisation or International Organisation for Standardisation (as they pedantically insist). The organisation consists of national standards bodies from each member country, and defines standards in many fields — everything except electro-technical comes within its orbit. It is an organisation more dominated by users and manufacturers than by the carriers. The ISO has, among many other things, developed the OSI 7-layer reference model since 1978 (OSI BRM — basic reference model).
The ISO works in conjunction with the ITU but, like the IEC, it is not in the United Nations hierarchy. There is an ISO/IEC joint committee called JTC1 (Joint Technical Committee #1) which has responsibility for terminal-based communications and computer issues.

ITSTC — IT International Steering Committee. This group coordinates the work of CEN/CENELEC and CEPT.

ITU-T — Stands for the telecommunications standards setting body operating under the International Telecommunication Union. Under its old CCITT name, the ITU-T has set many of the major communications standards (such as X.25 for packet switching and V.32 for modems).

NBS — The US National Bureau of Standards (see FIPS)

NIST — The US National Institute for Standards and Technology sponsors the OSI Implementors' Workshop (OIW), which has an input into GOSIP. It has a number of interest groups.

OSF — The Open Software Foundation is an international non-profit organisation developing an open, portable environment to which vendors and users had equal access (and supposedly equal input). It is a member-sponsored R&D organisation funded by a group of 200-odd companies led by IBM, DEC, and Hewlett-Packard. Currently it is designing an alternative form of Unix to AT&T's standard.
The OSF was originally a reaction to a decision by AT&T and Sun to use the SPARC chip as a binary standard and merge Berkeley and System V without consulting other leading players in the Unix field. The Unix wars are now over. In April '93, USL/UI and OSF agreed on common standards, and also agreed to conform to each other's published interface specifications.

SPAG — The Standard Promotion and Application Group is the European equivalent of COS in the US.

T1 — The T1 committee of ANSI is the American equivalent to the ETSI group in Europe. It is responsible for the majority of telecommunications standards decisions.

TIA — The Telephone Industry Association and its sub-division, the Cellular TIA, are involved in standards definition for cellular wireless telephone systems. It is responsible for the definition of the American AMPS and the Digital AMPS (TDMA) system, and more recently for CDMA 'wideband' radio systems.

TTC — The Telecommunications Technology Committee is the ETSI of Japan.

UI — Unix International is the AT&T sponsored non-profit group (including Sun, NCR, Unisys, Motorola and about 130 other vendors) that is trying to standardise and promote Unix System V and Open Look, in opposition to the Open Systems Foundation's OSF/1 and Motif. They are also involved in distributed computing standards, file systems, multiprocessing, etc. Their laboratory is AT&T's USL.

standing — the ISO, ITU and IEC. Although you might be tempted to think that the ISO is the highest-level authority, the ITU is perhaps the most relevant to telecoms — and there's no real hierarchy here.

The ISO, or International Organisation for Standardisation, sits at the peak of the pyramid in some ways, but only because it deals with the wider issues; and, in particular, with many computer standards. The ISO is a meta-organisation of national standards organisations, and is not (unlike the ITU) actually part of the UN hierarchy. It was founded at the end of the war in 1946 with the responsibility of setting standards for everything except 'electro-technical' which is reserved for the IEC.

I must say that there's something peculiar about an organisation that insists that its English-language name is 'International Organisation for Standardisation,' and then uses the capitalised reverse acronym 'ISO.'

If you've ever wondered whether the ISO/IOS difference was due to a Frenchified translation, made deliberately difficult by pedantic bureaucrats out to confuse the issue — and especially to drive you mad figuring out the difference between ISO and OSI — then you are partly right. The name isn't a French translation, but rather the cute use of the Greek term *iso* meaning 'equal to everyone' or 'the same,' so they say.

By extrapolation, they've made 'homogenous' into 'standard,' and then played some word-games with subtle distinctions: 'Organisation for Standardisation,' is not quite as authoritarian as 'Standards Organisation' you see, especially when you don't have official UN recognition.

The ISO's activities are initiated principally through user committees and manufacturers (via their national standards organisations) rather than from the carriers, who tend to enter into the process through the ITU/CCITT. ISO's Technical Committee 97 (TC-97) deals with information technology, and Standards Australia is our official representative. The Americans have as their representative, ANSI, the Europeans have ETSI, and the Japanese have the TTC.

As you'd expect of any organisation of bureaucrats living in Geneva since 1946, the ISO has a complex and laborious process of issuing new standards. It has both Subcommittees (SCs) and Working Groups (WGs) and everyone recognises that the organisation is badly in need of an overhaul.

In looking at a new proposal, ISO's TC-97 will begin with a Conceptual Paper, which then will evolve to a Draft Proposal (DP) and then later into a Draft International Standard (DIS) and eventually into an International Standard (IS). Usually a five digit number identifies ISO standards or drafts — and many years will separate the beginning from the end of the process.

The Major International Standards Organisations

ANSI — The American National Standards Institute was originally the ASA which gave its name to the standard for film sensitivity. ANSI is one of the major standards-setting organisations in the world, and the principle standards development organisation in the US. It also acts as the clearing house and coordination agency for standards. It represents the US position on international bodies like the ITU and ISO. Agreement within ANSI is generally easier to achieve than it is within the ISO, so many ANSI standards are preliminary and later evolve to international ISO or CCITT standards.
ANSI has a number of standing committees which, in the digital data processing area, are nominated by 'X + number' identifier. For instance X3 (established in 1960) is the designation of numerous committees working on computer standards and information processing: it parallels the ISO's Technical Committee TC97. Other X-committees include X9 working on data encryption and X12 for EDI standardisation, etc. The more specific Technical Groups within each X area are also given a number, as are the 'Task Groups.' So you get a group called X3T5.5 which translates to (X3) Computer related committee, (T5) Technical Group 5 (.5) Task Group 5 — which is responsible for TP, CCR, FTAM, VT, RPC and upper layer architecture. Sometimes only the Technical Group is specified as in the T1 transmission standards committees.

ATM Forum — A consortium of users, vendors and service providers who are working on an industry-wide standard for ATM (for voice, video and data/LAN-interconnect, based on PVC (Permanent Virtual Circuits) and later on SVC (Switched). Some of the activities of this forum extend into the B-ISDN area also, but these carrier activities tend to be left to the ITU-T.

BellCore — The old AT&T Bell Laboratories — or, at least, that part of the old organisation which remained with the seven Regional Bell Operating Companies (RBOCs). BellCore acts to define interconnection standards for the telephone companies. It has recently defined the SMDS standard, and is currently working on the PCS specification. It tends to define services and interfaces, rather than full specifications.

CCITT — The Consultative Committee on International Telephone and Telegraphy. Now renamed as the ITU-T.

CEBMA — The US-based Computer and Business Equipment Manufacturers' Association is involved in TOP and some ANSI standards, but is more interested now in promotional activities.

CEN/CENELEC — Comité Européen de Normalisation/Electronique is the general European standards organisation which has a number of committees; its standards are called 'EN' (European Norm). CENELEC is the independent committee for electrical equipment. They jointly look after information technology and the OSI functional standards, and CENELEC is responsible for potential radiation problems also. They are independently members of the ISO and IEC, and jointly with ETSI they run the ITSTC (IT Steering Committee) which is closely involved with the EWOS's (European Workshop on Open Systems) OSI activities.

CEPT — The Conference on European Postal and Telecommunications is a 27-country European telecommunications standardisation organisation which is equivalent to the US's ANSI T1 committee. It is the main governing body of the European PTTs. Within CEPT, ETSI is a sort of sub-group (which now dominates the organisation) acting as the standards-setting body for the formal EC countries. Norme Europenne de Telecommunications (NET) standards are mandatory for telecommunications in all European countries under CEPT, and a distinction needs to be made with the ETSs (ETSI standards) which are only voluntary outside the EC. There are a few workable NETs: NET 1 is for X.21, NET 2 is for X.25, NET 3 is for ISDN user- interface, and NET 7 is for ISDN terminal adaptors.

COS — The Corporation for Open Systems is a non-profit R&D organisation formed in the US in early 1986 as a consortium to promote standards — mainly ISO and CCITT standards. Its members are international, and include equipment vendors, service providers, and the large corporate and government users. Its charter is to promote the use of standardised technologies (mainly OSI and ISDN) around the world. It provides conformance testing, and issues a COS Mark. COS works closely with the ISO and ITU, and with the OSI Workshop. It has close ties to its European equivalent SPAG, and also to the MAP/TOP group.

ECMA — The European Computer Manufacturers' Association is a manufacturers organisation, and so is the European equivalent of the US's EIA for standards work. But, despite its name, it is not a trade organisation. It has its headquarters in Geneva and has worked entirely as a standards and technical review group since 1961 — as the coordinator between the manufacturers and the international standards organisations. It has close associations with the ISO and the ITU-T technical committees.

ECSA — The Exchange Carriers Standards Association. The American association of local, regional and long-haul carriers.

ECTEL — The Association of European Telecommunications and Professional Electronic Industry. ECTEL is primarily the European voice of the manufacturers of telecoms systems and equipment — it is what you'd expect the ECMA to be. It is a meta-trade association which has strong influence on standards through ECMA: its members are not individual companies, but the relevant national trade associations

EIA — Founded back in 1924, the US Electronic Industries Association is the oldest of the computer-related standards associations; it publishes its own standards, but it also submits proposals to ANSI for accreditation. It is a hardware-dominated organisation which is run by, and for, equipment vendors and parts manufacturers. It sets electronic and electrical interface standards, and it has been responsible for a number of important standards for equipment interconnection over the years (i.e. RS-232-C; the 'RS' is from 'EIA Recommended Standard').
The TR-30 (Technical Committee: Data Transmission) is responsible for the Physical layer of the OSI reference model, and it meets regularly with ANSI X3.S3 to coordinate work on the Data-Link and Network layers.

of Telecommunications) also. Both of these government bureaucracies create and administer standards themselves — and they communicate to ETSI, in turn, the national needs and desires of technology-based forums and private lobby groups in their own country. These bodies support various ad hoc or proprietary solutions to every problem, and this type of pressure on ETSI comes from every country in Europe.

Organising the Organisations

But before we get carried away with looking at these organisations in detail, let's just start with an overview and a structure — beginning at the top, which in telecommunications terms is the ITU (International Telecommunication Union) or perhaps, you could argue, the ISO (International Standards Organisation).

According to Bob Lions of Standards Australia, we can consider the formal standards-making process (at a government authorised level) to be organised in a hierarchical fashion with three levels:

- The International Level: ITU (with CCIR, CCITT), ISO, IEC;
- The Regional Level: ETSI, CEN/CENELEC, AOW, EWOS, OIW, IEEE, ANSI(T1); and
- The National Level: (US) ANSI, CSA, FCC; (Japan) TTC, JIS, INTAP; (Europe) BSI, AFNOR, AENOR, DIN; (Australia/NZ) SAA, SANZ, Austel.

It is also obvious when you think about it that some of the user or vendor organisations like COS (Corporation for Open Systems) and the MAP/TOP forum (Manufacturing Automation Protocol/Technical Office Protocol) and other groups run by manufacturers and users, play almost as important a role as the official bodies — albeit, often with a narrower focus on certain technologies or problems. For instance, the SMPTE, which is the US Society of Motion Picture and Television Engineers, is virtually the world authority on film standards — although it is only regionally dominant in television.

There are literally hundreds of these organisations, and they seem sometimes to form and dissolve like clouds on a summer's day; one minute they are churning out press-releases, and the next they've dispersed, or been absorbed, or renamed. But some have also been around for a long time. I was going to attempt to provide a definitive list of these organisations, but frankly, life's not meant to be this difficult. Every newspaper or magazine I read had a new one with some esoteric acronym. So I've just collected details of the most important.

The Gnomes of Geneva

From the viewpoint of telecommunications, the top position is shared by three Swiss-based organisations of almost equal

Navigating Through the Standards Maze

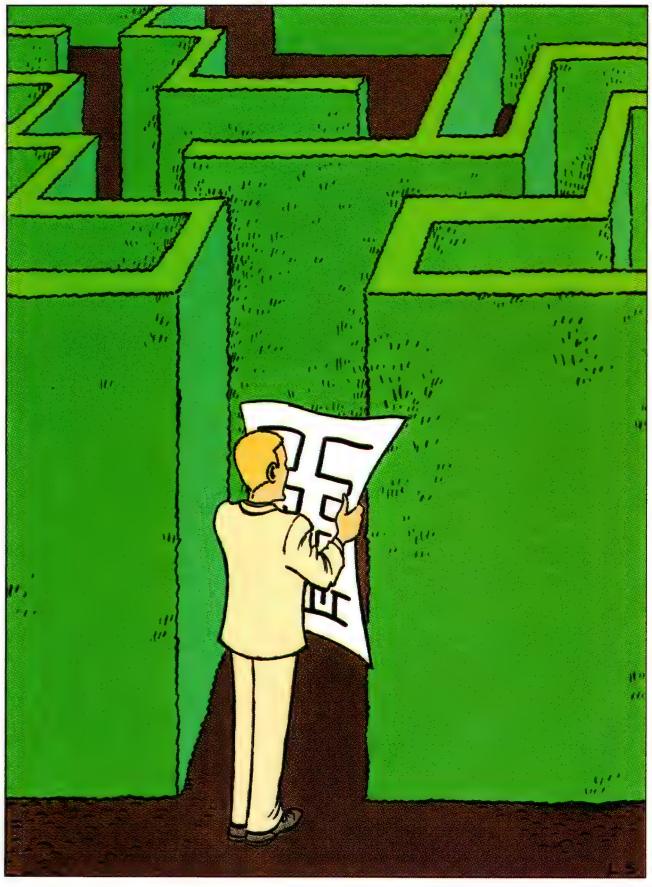
It's little wonder that there are so many standards when there are so many standards bodies producing them. Stewart Fist examines the roles played by the major world standards organisations.

The old cliche about standards being so useful because there are so many to choose from is as valid today as ever before; so when I was first asked to write about the major standards organisations in telecommunications and computing, I must say my reaction was to sarcastically inquire whether it was to be a five- or ten-part serial. The fact is, that standards issues are not peripheral in this industry, they are central. As Sheila McGregor of law firm Freehill Hollingdale & Page remarked at ATUG '93, "There's a huge telecommunications standards-setting industry out there, with literally hundreds of working groups and thousands of individuals involved in the process." So if you've ever wondered where all Telecom's excess profits go, you've only got to look at the standard-setting complex and see how it benefits the Swiss economy.

This 'central-to-the-industry' difference is a concept which has not been grasped by many in the computer industry, where standards tend to be an afterthought — often just some documentation that Microsoft or IBM wrote after they'd dominated sections of the industry for years. But there's no point in talking into a telephone unless its connected to another with the same characteristics at the distant end, and, as Peter Darley, Chief Engineer of Standards for Telecom, succinctly puts it, "A new ISDN phone linked to a digital exchange in Sydney has to be able to talk to a village phone on a manual exchange somewhere in rural China."

And its the same for data. Fortunately LAN management and LAN interconnect are beginning to breed a corporate culture which has its feet in both computers and communications, and the importance of standards issues is now becoming better understood.

So there's got to be some protocols, some agreed standards, which match the two pieces of terminal equipment, and also some that allow the carriage of information between them. And these standards need to remain backwardly compatible over time with the enormous global network already in existence — even in these days of rapid change. And don't forget that long-distance transmission can be over a multiple chain of national carrier links; so carriage and interface standards, and the availability of support services, are vitally important on both a national and international scale.



What's more, the standards bodies of the world sit uncomfortably between the research and development organisations, the vendors, the regulators, and the carriers, and are constantly being pressured from all sides. And both R&D and standards issues are now run by (and on behalf of) trading blocs. It is often hard to see where the work of the RACE (Research in Advanced Communications technologies in Europe) and ETSI (European Telecommunications Standards Institute) begin and end. R&D, standards definition, regulation, allocations of global resources (orbit slots, and frequencies) and economics-markets-politics is often inextricably entwined in the standards development processes.

Organisations like the pan-European ETSI are subject to political-economic pressure from individual government administrative organs like the UK's DTI (Department of Trade and Industry), and regulatory concerns of the UK's national regulator OFTEL (Office

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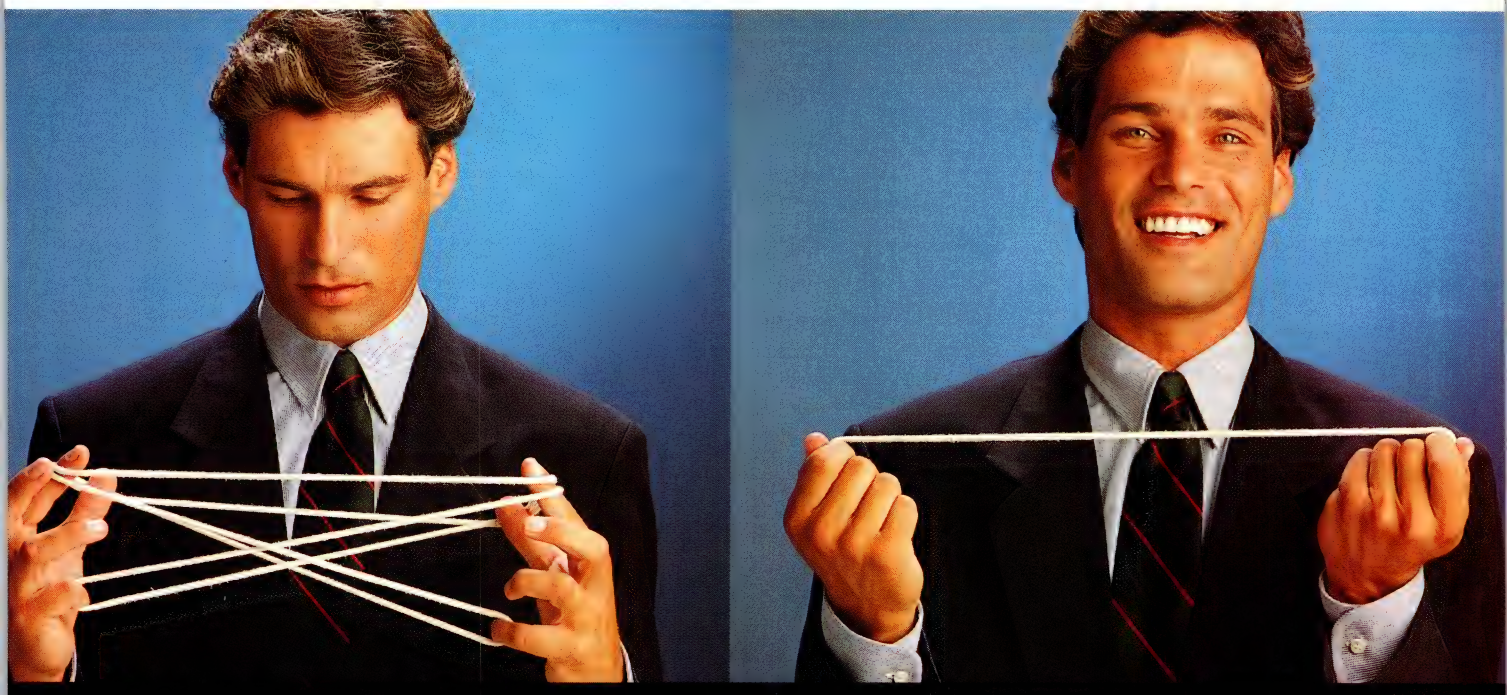

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Microsoft is attacking this problem with what might be called a fill-in-the-blanks strategy. By releasing products like Visual Basic, Workgroup Templates, Electronic Forms Designer, assorted tool kits, development kits, etc. and by moving towards a single extensible macro language for all applications and bringing new applications like Access — which is designed more as an intelligent front-end for other database engines than a standalone product — to market, Microsoft intends to put a single consistent groupware platform in front of a workgroup. Taking either approach gives the same result; for a one-off task a group of users has to co-operate in real time. If the task is one which must be repeated on a regular basis then the group can 'record' and automate the structure of their co-operative processing for later use by one or more of them.

Which approach is best depends entirely on the task at hand. In both Microsoft's and Lotus' approach to groupware the problem of rendezvous is side-stepped by storing core components of the groupware application on a server which, presumably, is always available. Unfortunately this side-step only works within a workgroup; try it across an internet and you risk breaking an ankle. The simple and inescapable fact is that as the number of workgroups in a network grows the probability of a server being unavailable (either shut down, broken down or unreachable) increases.

This situation cannot always be addressed by a simple — i.e. real time — connection-oriented mechanism such as a protocol like TCP/IP or IPX/SPX. To return to the telephone analogy, what happens if you call your colleague and don't get through? You know how to deal with an engaged signal or an unanswered phone, but what about a dead line? You might log a fault call but with whom? Is the problem with your PABX, Telecom's equipment or Optus'? You can't tell because the API set you are dealing with has abstracted you from the actual mechanism of making the call.

In the case of two groupware applications trying to communicate, the same situation has three possible solutions. The least desirable option is that the client application can't handle the error and halts. The most obvious alternative is to build error handling into the client but how much? Would you like a nice recorded message which told you that port 6 on rack 6 in frame 6 at the down line exchange was faulty when you couldn't get your phone call through? What you need, and what happens (or is supposed to), is that you get an error, you notify Telecom, wait for Telecom to signal that the problem has been corrected and then make your call.

To put this in the context of the Workgroup networking model you need an intelligent layer which is capable of taking your message and working with layer 2 to get it to its destination or returning it with a reason for the failure which your groupware application can understand and handle. This is the job of a messaging architecture.

Messaging Architecture

There are three main messaging architectures which would-be Workgroup Networkers are most likely to have to consider; X.400, VIM and MAPI.

Each of these has an API specification. X.400 is widely implemented by minicomputer and mainframe vendors and therefore can be critical in groupware applications spanning traditional as well as PC platforms. Both MAPI and VIM are supported by a cross section of the industry, however it's been a year since I first reviewed them (see 'Misconceptions, Messaging, Mail and APIs,' *Australian Communications*, October 1992) and the market seems to have exploded with a whimper rather than a bang. The VIM consortium has just released its version 2.0 specification and started to ship the VIM SDK version 2.0 which extends the version one API set to cover Notes — which has its own API set anyway — and adds some functions for cc:Mail — which also has its own API. As far as implementation is concerned, Lotus seems to be doing most of the work by building VIM support into its products. At this stage there are too many phases like 'is implementing' and 'will support' in the literature discussing VIM for many to consider it to be far from the jellyware stage.

Microsoft has something of an edge in that MAPI is part of WOSA (Windows Open Services Architecture) and Windows in all its forms is dependant on WOSA. Having bet its corporate future on Windows Microsoft has had to deliver WOSA's elements in a timely fashion. In order to do that it has had to deliver MAPI on schedule. Having said that, it must be pointed out that only simple MAPI is in Windows today which makes its final potential hard to assess.

The main advantage which MAPI, or more correctly WOSA, presents to developers is that a significant part of the final implementation is sitting on a large number of desk tops right now in Windows and Windows applications. Another advantage is that WOSA's API sets are consistent. In VIM land you have the Notes API, VIM API and the cc:Mail API from Lotus alone. Maybe in another 12 months there will be a clear winner in the MAPI vs VIM debate. Right now the VIM consortium seems to be doing a Don Quixote impersonation and there are few solid indications as to whether MAPI is a giant or just a windmill.

Contributors to *Australian Communications* have written often on various aspects of messaging so it's unnecessary to discuss the mechanics of message handling systems here (see in particular Alan Lloyd's *OSI Tutorials* 'X.400 MHS and OSI,' 'X.500 Electronic Directory Service,' and 'Designing for Messaging Systems' in the November 1992, December/January 1992-93 and August 1993 editions respectively and 'Delivering E-Mail for the Enterprise,' by Salvatore Salamone in the April 1993 edition). The important point, in the context of workgroup networking, is that any message handling system you choose has to fill the requirements of layer 3 of the workgroup networking model I've drawn.

Specifically it must abstract groupware from the mechanics of message transfer, it must provide a mechanism which will pass a message (which will be in a well-defined format) carrying data (which will be of arbitrary format) between two processes, it must be independent of Transport Protocols (i.e. layer 2) and above all it must deal with the problem of rendezvous. In short, it has to store and forward messages transparently in a heterogeneous environment. Notice that this specification pretty much defines an e-mail system. All that is missing is a server and a client, both of which belong at the groupware layer.

E-mail is a trivial example of a groupware application which uses a message architecture to solve the rendezvous problem. The fact that once the messaging system is in place, the groupware level of an e-mail system is trivial, is the reason why Microsoft can afford to give away MS Mail and Schedule+ client code with some of its products and a full blown workgroup mail server with Windows for Workgroups and NT. All you have to pay for is the complex pieces such as MTAs (message transfer agents) or remote clients.

In summary, workgroup networking consists of four basic elements, the first two of which — groupware and messaging architectures — I've discussed here. Workgroup networking in a PC environment requires a network platform and an effective implementation of the client-server paradigm at the application level.

The deployment of groupware effects the traffic flow within the network platform on which it runs and requires a more sophisticated hardware platform than that required to support simple non-co-operative applications.

But possibly the most important consequence of implementing a workgroup networking model is that the benefits of workgroup computing are directly related to users' proficiency with the tools which are at their disposal. Next month we'll take a look at the implications of workgroup networking in the areas of NOSs, protocol choices, hardware platforms and system management.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

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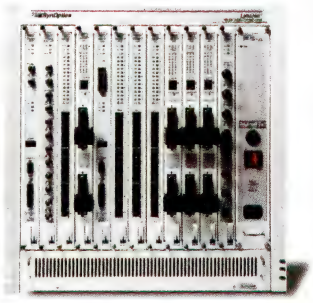

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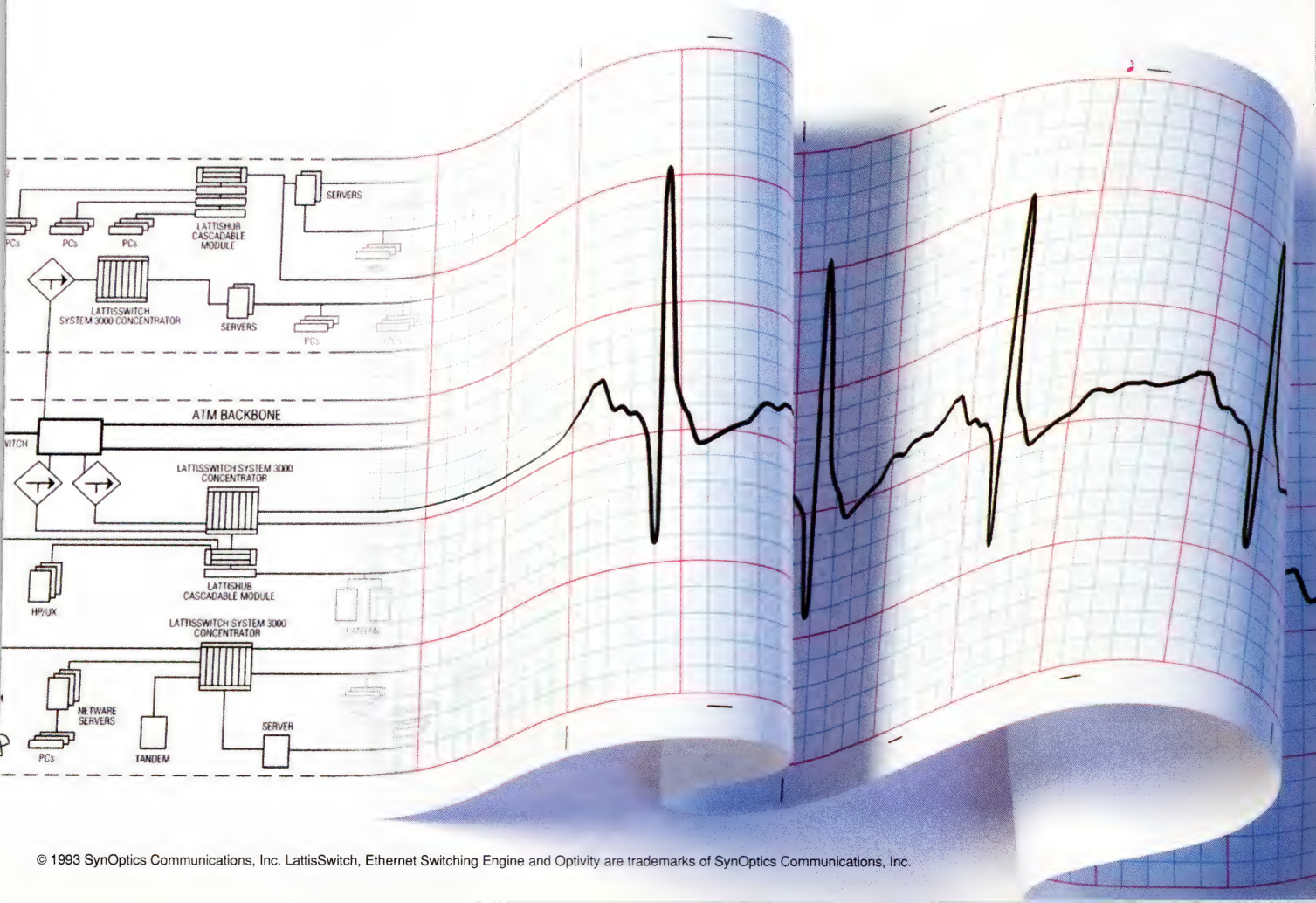
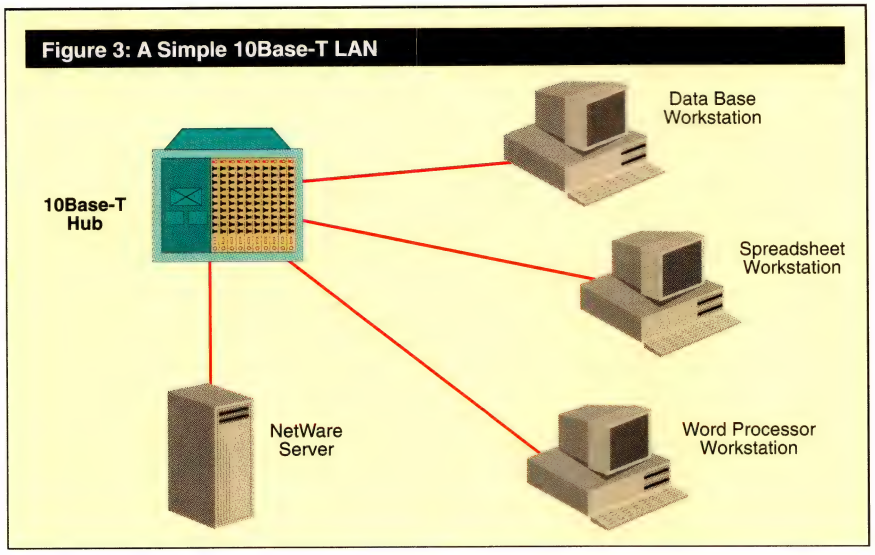




to generate the tables and graphs, and that all data files — i.e. for all three applications — are stored on the NetWare server.

Now as far as the NetWare server is concerned it has three clients, each of which has a single file open. This is no different to the situation in which client-server computing is confined to a single hardware platform — purely local DDE — but that is where the similarities end.

Firstly, the nature of the traffic flow in the network is fundamentally changed. We now have traffic between workstations as well as between workstation and server. Secondly, the type of traffic has changed. Inter-workstation traffic in a Windows for Workgroups environment is generally based on NetBEUI which is a broadcast based, non-routable protocol. IPX/SPX, which is most common in a commercial LAN, is routable, and while it uses broadcasts it does not use them as heavily as NetBEUI. Further, the NetDDE traffic will most likely consist of a number — potentially a large number — of small network packets, while the IPX/SPX traffic will consist of fewer, larger packets.

The problem of rendezvous also has to be faced. In a purely local DDE environment a single user would have both a spreadsheet and a word processor running at the time a DDE link is made. After all, he/she would have had to select the data in one file they needed to link to another file before establishing the link. In the case of NetDDE the WP user has to ensure that the two other workstations and the server are running before he/she can establish the link needed. If the database user is out of the office and nobody knows the password — which is as it should be — the other two users cannot continue to work on the report.

This is a big enough headache if the users are in the same room. Imagine what it is like if they are in different cities, organisations and even countries. Imagine what happens if these three client-server processes are not user applications but parts of a distributed database system — say a credit card system which you use via an ATM or EFTPOS outlet while overseas or interstate. As mentioned above, the problem of rendezvous is non-trivial.

Given that all users are at work, all of them are running their client-server applications and that the network is intact, there is one less obvious difference between the local DDE case and that using NetDDE. In this latter case we have three applications which are co-operatively processing a single data set — the database on the netware server — to produce a single output — the report — across three hardware platforms — the workstations. If you like, we have a workgroup of three people using a single workgroup-wide application on a distributed platform. We have a simple example of, and a definition for *groupware*.

Groping for Groupware

A groupware application is one which is composed of a number of processes which co-operate to enable a workgroup to perform a given task. Notice that this definition implies that the implementation of a groupware application is dependant upon the processing environment at which it is targeted. A workgroup implies one or more people, and in a PC environment that requires a LAN implementation because the norm in a PC environment is one user per hardware platform.

Groupware is not a new concept; for example Digital and its customers have deployed VAX Notes for years. As a matter of fact VAX Notes predates its Lotus namesake by about as many years as Lotus Notes has existed, and there are many parallels between the two products, though Digital is a little more specific about its target market. Unfortunately, as Lotus Notes' proponents are quick to point out, you need a VAX and VMS to run VAX Notes. This means a certain amount of VMS expertise is required on your site and this might be difficult in an all-PC environment. It will be interesting to see whether Digital ports VAX Notes to Windows NT.

Those who are familiar with Lotus' Notes product will realise that our example of creating a report on a word processor from a database via a spreadsheet does not match Lotus' vision of the implementation of a groupware application. The main drawback with the situation I have described is that all three processes have to be available and running for the report to be available, and even after the report has been completed anyone wanting access to any part of it for any reason — say the spreadsheets for use in an action plan implementing the report's recommendations — has to arrange that all the processes required are running and available. You also have to create the links between processes manually.

One way of avoiding these problems is to provide an engine which one user can put data into, which allows another user to interpret that data — preferably by enhancing rather than altering its original structure — and which then allows that data to be extracted in a structured fashion. It would also be nice if the extracted data could be circulated automatically. By taking this approach you open the possibility of being able to cross reference your report data with other data and thus create a number of different reports from data sets which might have ordinarily been considered unrelated.

Lotus Notes is intended to provide a platform on which just this sort of processing can take place. However Notes has a price. First of all you have to supply a hardware platform which is running the Notes server process and which in most cases will run 24 hours a day, just like the NetWare server. Secondly, Notes is not clairvoyant. You have to write a Notes application which means learning a new language. Finally, in most situations you are going to want to present your extracted data and so will have to import that data into an application which will allow you to format it for presentation — like a word processor.

It is these costs that justify Microsoft's vision for a groupware future which is far closer to our original example. If our three users all ran a WP package, a spreadsheet and a database program then the elements which constitute the groupware application which creates the report are queries, macros, style sheets, etc. Break these out and store them with the data on the server and you have your 'application' with minimal extra hardware requirements and little in the way of added training requirements — assuming users know how to use macros and the like in existing applications packages.

Of course there are several holes in this theory; what if there are no existing packages? What do you do when you have to get existing applications to interact in a way that their macro languages do not support?

'network servers' — meaning the hardware platform providing a variety of services — may act as either clients or servers in the context of the client-server paradigm. For example, two network servers may provide file storage to client PCs, but if only one has a tape drive then the other must act as a client in order to backup its data to the tape unit.

So much for the client-server paradigm. What about client-server computing and why all the hype about it? To date the PC industry has applied the client-server paradigm, in a restricted form in most cases, to little more than network operating systems; however the rest of the IT industry has applied it far more widely for years.

Client-server computing is the extension of the client-server paradigm to applications and operating systems. Consider a DOS workstation on a simple NetWare-based LAN. When that workstation runs a word processing package to edit a file stored on the LAN's server the workstation's NetWare shell acts as a client. The word processor simply edits what appears to be a local file.

There is no client-server relationship between the file and WP package. But if we install Windows on the workstation and run a Windows-based WP package which supports DDE we have a somewhat different situation.

Nothing changes as far as the LAN and NetWare are concerned, but any Windows application which supports DDE is capable of acting as either a client, a server or both. If I have a spreadsheet running which supports DDE then I can set up a DDE link with my WP program.

If both packages fully support DDE a user can change spreadsheet data from inside his or her WP package and vice versa. To do this the package in which the user edits a piece of data initiates a DDE transaction — i.e. acts as a client — while the other package processes the transaction — i.e. acts as a server. This facility is now pretty common. Next time you have a Windows application running search for DDE in the on-line help index.

The irony here is that while many network administrators are struggling with the question of whether or not to implement client-server applications, they have long since deployed them, and in most cases without either they or their users realising it. Note also that this particular aspect of client-server capability provides its benefits at a price. The platform required to support DOS, a NetWare client, Windows and two concurrent Windows applications is significantly more sophisticated than that required to support DOS, a NetWare client and a single DOS application. And if the new platform's client-server capability is to be used efficiently then a far more sophisticated end user is required. The latter necessitates education.

Figure 2a: The Layer 4 Connection

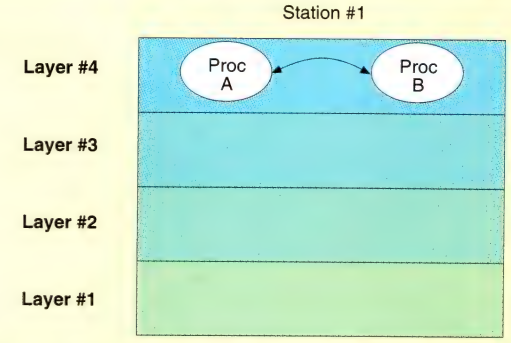


Figure 2b: Using the Messaging Architecture

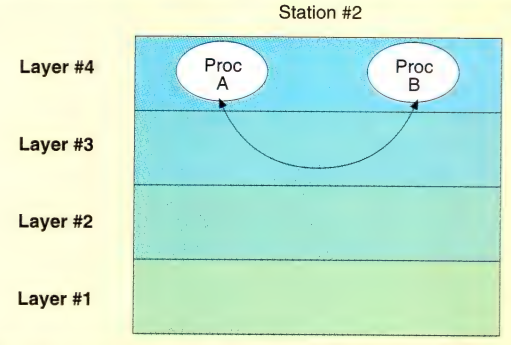
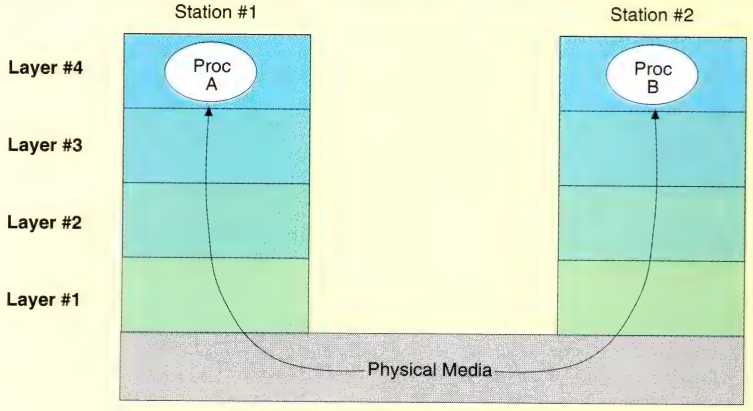


Figure 2c: Across a Network Link

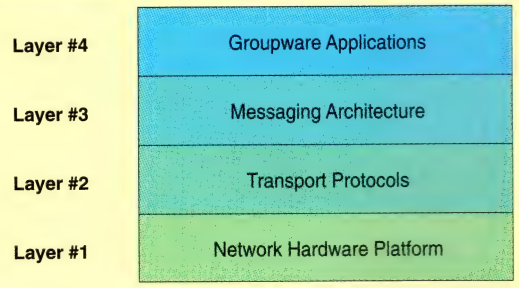


Local client-server computing has little or no negative effect on a network. In fact its effects can be quite positive, since client-server applications are generally better behaved than non-client-server applications. For example, a Windows application does not ordinarily write direct to a PC's hardware, it uses an API call to a Windows sub-system. Once the network accommodates the sub-system it automatically supports all applications — another example of the principal of abstraction discussed earlier.

Where most of the hype and confusion has arisen is when the concept of client-server computing is applied to application processes which are physically remote — i.e. when the platform is a network. If we replace Windows in the example above with Windows for Workgroups then, assuming that all our Windows applications have been written properly, we have the ability to process DDE transactions across a network — i.e. NetDDE.

Now assume that three people who are all working on a report have such workstations on a simple 10Base-T LAN (see Figure 3 on page 74) and each workstation is running a different application — a database, a spreadsheet and a WP package. For the purpose of creating a report assume the WP workstation uses NetDDE to include tables and graphs generated by the spreadsheet in a document; the spreadsheet workstation uses a NetDDE link to the database

Figure 1: The Workgroup Networking Layer Cake



The first use for the model is to place the concept of client-server computing in context — after laying a few foundations. A process, be it an application, Windows DLL (Dynamic Link Library) or hardware driver, communicates with another process via a well-defined mechanism.

If the definition of this mechanism is publicly available it can be said to be an *Open* mechanism. An application, operating environment, etc. which is composed of a series of such open inter-process communication mechanisms may be said to have an *Open Architecture*. If the definition of an open mechanism is controlled by a body which is independent of any single vendor then it may be termed an *Industry Standard*. If the body controlling a definition is an accredited standards organisation — e.g. ISO, IEEE, ANSI or the like — then the definition is that holy of holies known as a *Standard*. If the definition is controlled by a single vendor, but is so widely accepted that the vendor could not alter the definition without significant business risk the definition can be said to be a *De Facto Standard*.

For example, X.400 is controlled by CCITT and is therefore a standard. VIM is controlled by a consortium of vendors and is therefore an industry standard. The Windows API set is controlled by Microsoft but has such a large installed base that Microsoft must ensure backward compatibility and therefore Windows' API set may be considered as a de facto standard.

Whatever else it may do a mechanism which a process can use for communication must permit the transmission and reception of information. There are two basic models for the transmission and reception of information. The simplest is a *connectionless* model. This is like posting a letter with no return address. You address the letter, put it in the mail and forget it. If the post office cannot deliver it, the letter is simply sent to the Dead Letter Office — 'dropped' in network parlance. It can't be returned because you didn't put a return address on it.

A model which is generally more useful is that of *connection-oriented* communication. In this model a connection is negotiated between two processes, data is transferred and its reception is confirmed. A connection-oriented communications mechanism is generally a pre-requisite for a practical client-server computing platform, but it is not absolutely necessary. SNMP, for example, does quite well using a connectionless model.

Workgroup networking, however, makes use of predominantly connection-oriented models. There are now several mechanisms which can provide connection-oriented communications in the model given in Figure 1. For example; DDE (Windows) and pipes (OS/2, UNIX) within layer 4; NetDDE, WINSock, Steams, MAPI, VIM and XAPIA at layer 3; TCP, NetBEUI, SPX and X.25 at layer 2.

There are three possible routes which a connection between two processes can take. In Figure 2a on page 73 process 'A' is connected to process 'B' via a mechanism which is internal to layer 4 — for example DDE. In Figure 2b the two layer 4 processes are using a layer 3 mechanism to communicate — for example a word processor sends a mail message to a local post office. In both Figure 2a and Figure 2b communication takes place between processes on the same hardware platform.

In Figure 2c the inter-process connection has been established via a network link — for example a Lotus Notes client retrieving data from a Notes server. The important points here are that the location of the processes is only relevant in so much as the choice of communication mechanism is concerned and in that the two communicating processes will be at the same layer.

This second point may seem a little obscure at first, but remember that the layers in this model are independent and thus the internal architecture of one layer — i.e. the processes which comprise the layer — is invisible to other layers. The point of using APIs to communicate between layers is to provide this abstraction.

As an analogy consider the process of making a phone call to set an appointment with a colleague. You know your colleague's name so you use an API to query a local process to find his phone number — you look up the phone book — then you use another API to establish a connection-oriented communication — you pick up the phone and dial the number you just found — and finally you talk to your colleague and make your appointment. The first API you used, that is the alphabetical nature of the phone book, abstracts you from the processes used to assemble the listings therein. The second API you used, dialling a phone number, abstracts you from having to understand the mechanics (or electronics) of the phone system.

There are three main justifications for this approach; firstly even if you could manually switch all the necessary exchange circuits to establish your call why would you bother? Secondly what if you made a mistake or someone else made a mistake and interfered with your call? Such a system could be most unreliable. Finally your phone company would be restricted to using a type of equipment which you knew how to use, rather than any one which simply provided the APIs you understood.

The Client-Server Paradigm

The processes which communicate as described above can act in two possible ways. A process can initiate a communication or it can wait for another process to contact it. For practical purposes a process has to be running before it can be contacted.

This may sound obvious but it is not — especially in a wide area internet — and it is certainly not a trivial problem. It is referred to as the 'problem of rendezvous' and the client-server model — or more correctly the client-server paradigm — was developed largely as an attempt to solve it.

The client-server paradigm defines a *client* as a process which initiates a communication and a *server* as a process which responds to the communication request. The paradigm asserts that the server must be running before communication is initiated. Processes are constrained to act as clients or servers in the context of a communication. They are not constrained to act exclusively as clients or servers, nor is there any constraint on the number of communications in which a process may concurrently participate. Therefore a process may be acting as a client, a server or both at any given time.

For example a Digital VAX running a database application under VMS may be providing simple query responses for a number of PC clients — i.e. as a server — at the same time as acting as a part of a distributed processing platform — i.e. as both client and server. The database application may be exporting a transaction file to a remote host as well, and therefore be acting as a client of that host. All PC network operating systems — peer-to-peer or otherwise — are valid examples of the client-server paradigm.

In the case of non-peer-to-peer systems workstations act exclusively as clients while

Just What is Workgroup Networking?

Workgroup networking has four elements: groupware, messaging architectures, transport protocols and net hardware. In the first part of a two-part article, Graeme Le Roux examines how they fit together.

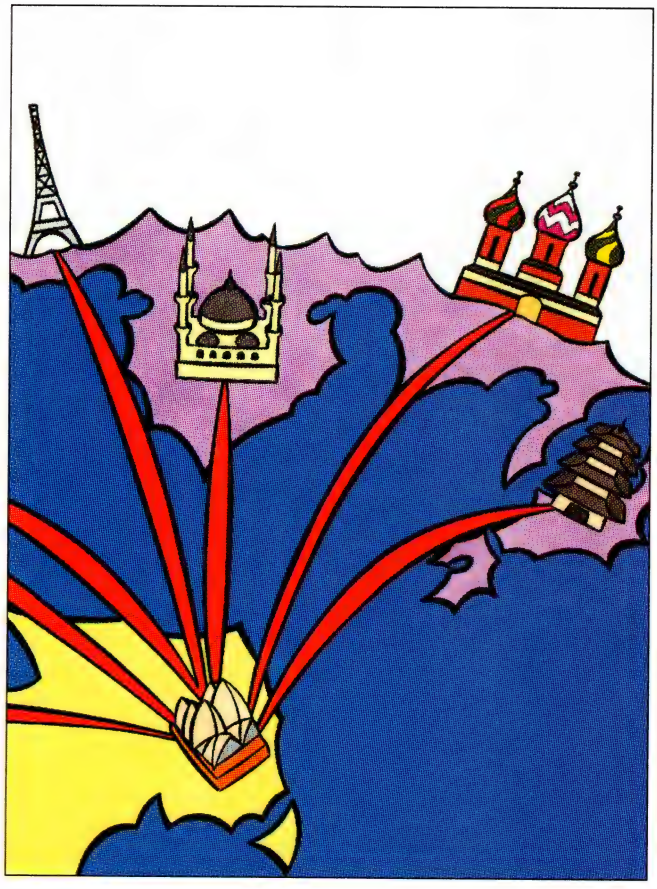
Based on the amount of money the IT industry has poured into workgroup networking it would appear that the industry at least sees it as an important issue. Unfortunately, for network managers trying to decide whether or not workgroup networking is important to their employer, there is no objective definition of just what it is.

At times the term workgroup networking is used interchangeably with workgroup computing, further confusing the issue. And if you read the 'white papers,' 'background briefs,' 'discussion papers,' etc. which are put out by all the major vendors you quickly gain the impression that workgroup networking is intrinsically linked to the concepts of groupware, client-server computing, messaging architectures, peer-to-peer networking, FDDI, ATM and just about anything else which might persuade you to buy a given vendor's products.

In fact the only point upon which all vendors seem to agree is that workgroup networking is supposed to enable people to work together more efficiently, and consequently more productively. If you find yourself reminiscing about previous brave new computing world visions like the paperless office then you're not alone. However while workgroup networking, by any name, is being used as a marketing Trojan house it is an important concept. If nothing else, implementing a concept designed to help people work together more efficiently and therefore productively is a highly desirable goal.

Modelling the Hype

For the purposes of trying to judge the next piece of marketing hype which lands on your desk, it's useful to think in terms of a practical workgroup networking model. As shown in Figure 1 on page 72, this model has four major elements as its cornerstones: Groupware Applications, Messaging Architectures, Transport Protocols and a Network Hardware Platform. Bear in mind that it is a device developed as a framework around which to place the elements of workgroup networking. This model is not a standard, nor a basis for any standard!



Like the OSI model this workgroup networking cake's layers are numbered from the bottom up and are independent. Communication between layers is via well-defined interfaces. Some products span layers. For example Microsoft's Windows NT operating system has elements which belong in all four layers — HAL at layer 1, Streams, NetBEUI and DLC at layer 2, NT's messaging sub-system at layer 3 and NT's e-mail application at layer 4. The interfaces between layers are application program interface (API) sets. Which API(s) provide a given interface depends on whose plumbing you are using. For example you might choose MAPI (Messaging Application Programming Interface) or VIM (Vendor Independent Messaging) as a messaging architecture for your groupware applications. APIs may also be used for interprocess communication within a single layer. For example a Windows application may use DDE (Dynamic Data Exchange) to communicate with another application.

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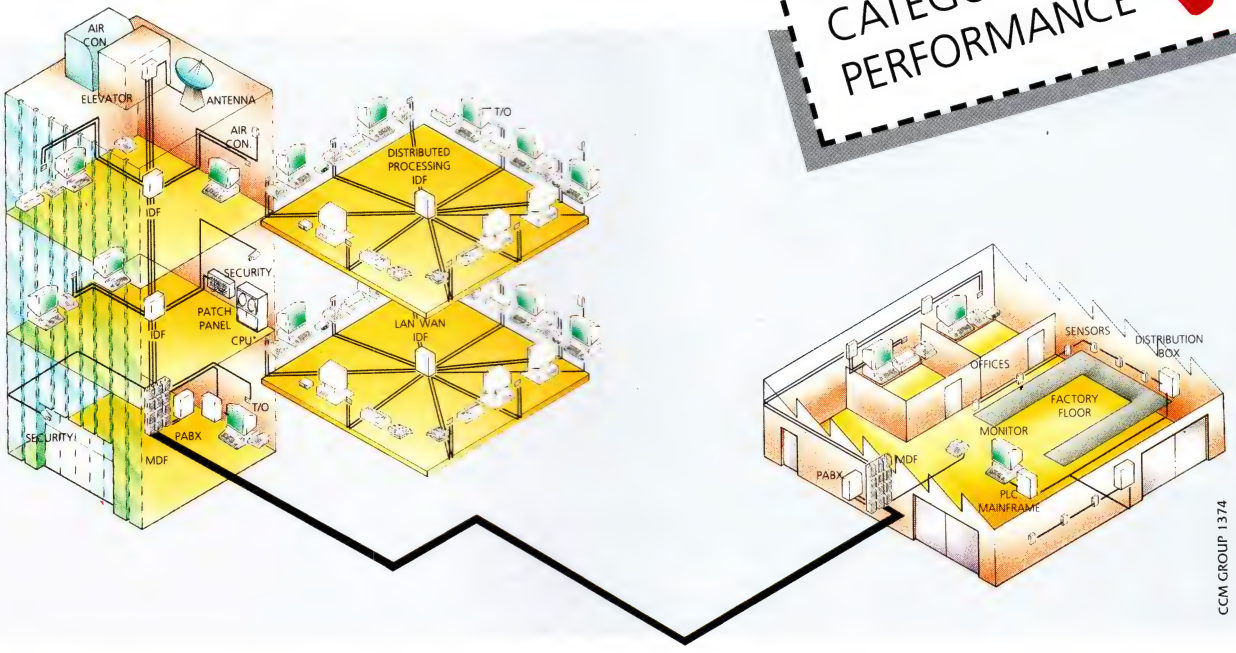

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93/19

Rob Durie

Fibre-to-the-Home: Making It a Reality

Pay television, video films and games on demand, interactive television, high definition television, home shopping, home banking, videophones, telecommuting and teleconferencing — the list of broadband services which could potentially be provided to the home and small businesses via an optical fibre network goes on and on.

Pundits are urging the Australian Government to move quickly and follow President Clinton's lead on a national optical fibre information highway. The plethora of services listed above, and many more besides, will then be available to consumers around Australia. Or will they? With Australia probably the last developed country to get pay television — almost certainly at least another 15 months away, depending on how quickly the present imbroglio over licences is resolved — it is possible to see many obstacles in the way of achieving the potential of the brave new world offered by fibre-to-the-home.

On the other hand, recent developments suggest that the Government and other potential players are giving serious attention to the policy and business challenges presented by this brave new world. The Communications Minister, David Beddall, is establishing an Expert Group to advise the government on the provision of broadband services to the home and small business. The recently announced *Communications Futures* study by the Bureau of Transport and Communications Economics will consider the technological, market and regulatory issues surrounding emerging developments in communications. On the commercial front, both here and overseas, potential players are moving to position themselves to take advantage of perceived new market opportunities.

One of the striking aspects of the debate about fibre-to-the-home is the similarity of the debate in Australia and in other countries — the US and Japan, for example. In each country there have been the same discussions about infrastructure costs, the degree of government intervention required, the need to rewrite regulatory policy and the reality of likely demand. Market demand issues are of particular interest. What will shape demand for broadband services to the home is not well understood. In more developed markets, questions are being asked. While possible markets include large and small business, education and others, the push for infrastructure is preceding a clear vision of what services can be supplied profitably.

While home banking and home shopping are touted as possible services, they have not yet been a commercial success anywhere in the world using existing technology. At present the only clear economically feasible market appears to be video films. This has prompted the American commentator, George Gilder, to argue that initial profits for a fibre network must come from entertainment video. These profits may then fund other applications in education, medicine, and research, ultimately building them to profitability.

Of course in Australia, this is more problematical, in view of the peculiar arrangements for Pay TV which may delay the introduction of fibre-to-the-home.

For many years, we have been told about the convergence of the technologies underlying computing, telecommunications and broadcasting, and the major impact this will have on our lives. Fibre-to-the-home will finally bring these predictions to reality. For regulators, this means a re-examination of the hitherto largely separate legislative framework for telecommunications, broadcasting and radiocommunications. It is important is that we act to ensure the provision of a broad policy framework which is technology neutral. The experience with Pay TV should surely have taught us that lesson if nothing else.

Technical regulation is also a critical area. There will need to be a careful balance of administrative and self regulation on several levels. Too much regulation of the technical specifications for interfaces and products has the potential to stifle innovation and product development.

However, this needs to be balanced against the need for open systems, particularly for user interfaces. Open interfaces will ensure the maximum degree of innovation, product diversity and choice for users. It will also mean users won't have to buy proprietary decoders and connectors for each different service selected.

The balance between administrative regulation and self regulation is also important for keeping costs down. The costs of compliance with Austel's existing approach to regulation are horrendous, and the introduction of many ISDN products has been delayed or cancelled due to the high costs of compliance relative to the small size of the market. There should be no need to redesign products to meet Australian technical standards, as is often the case now. Such waste has the potential to stifle market growth.

There are also public policy questions about the supply of equipment for a national fibre network. The Australian telecommunications market is a relatively highly protected one, with considerable government intervention and regulation. For example, the supply of customer premises equipment is controlled by industry development arrangements which effectively require most products to be made in Australia.

On the other hand, the supply of computing and broadcasting equipment is relatively unregulated, with commensurate benefits in product innovation, customer choice and price. Government will need to decide which of these very different regimes will apply in the future, as it will be increasingly difficult to segregate these markets.

If, increasingly, national productivity is to be built around the control, access to and use of information, then convergence of the technologies in Australia has to be at world best practice levels, otherwise, Australian enterprises risk being placed at competitive disadvantage through higher prices. In the Information Age, Australia is no longer an 'island market.'

Rob Durie is the Deputy Executive Director, Australian Information Industry Association (AIIA).

Tom Amos

Warm Feelings

The evolution towards the wireless world is continuing at an ever increasing rate, with new services and technologies being introduced to match spiralling user requirements for timely and accessible communications. The continued penetration of wireless technologies is now exposing the whole community to the use of radio-based services which only a few years ago were the domain of those who needed specialised mobile services.

This spread of wireless devices has at the same time moved at such a pace in relative terms that the non-technological issues such as sensible guidelines for use and the health and safety issues have been swamped by the quest for the ubiquitous radio access system. At last count, there were over a dozen new or innovative radio-based technology solutions that were all vying for attention, and only some of those have made their way Down Under. Ones that will be familiar to the user include the digital cellular mobile system GSM, its older analogue cousin AMPS, and CT2, DECT and the newer trunked mobile radio technologies. In most of these technologies the trend is towards the development and introduction of hand portable units. Gone are the cumbersome luggable telephones, replaced by slim lightweight items that perform better . . . or do they?

What the user probably does not realise is that there are a number of technical trade-offs that are made at the operator system level in order to deliver an affordable radio service. The optimisation of the commercial opportunity determines how much is invested in the backbone infrastructure compared to that invested by the user to access the system. In general, the dictates of up-front capital expenditure on network rollout versus the recurring revenue base means that new radio services are introduced with considerably less base sites. These in turn are required to have a greater average coverage area than, say, a mature system would have with a large recurring traffic load. This means in general that the new infrastructure cost is skewed towards the user, who may need to purchase higher power units in order to gain the same coverage that would be provided by a more mature, loaded system.

Up to eight times the peak power transmitted from the user unit to the network may be required to achieve the acceptable performance on the newer systems, and this increase in peak power level needs to be carefully considered when viewed in the light of what is acceptable from a health and safety viewpoint.

The radio emissions from a user handset are non-ionising and, contrary to popular opinion, provide only a form of heating to the things and objects close by and coupled. This heat is not unlike solar insolation, although there is a resonance component to the heating, and the coupling efficiency component is still not well understood. Who cares anyway?

Some years ago, after exhaustive research, the ASA published a standard (AS 2772) on Maximum Exposure Levels for radio radiation and set some levels for radiation emitted by continuous wave devices, along with some interesting exclusions. The exclusions basically comprised at that time all hand portable devices which operated at less than 1,000MHz, with an output power of under seven watts, on the grounds that it was unlikely that such devices could couple enough peak energy into the user's body to cause excessive local heating, and that it was impossible to control anyway — an interesting cop-out at a time when there was intense public interest in health and background radiation levels.

What has changed is the potential coupling efficiency of the radio emission into the user's body. In the analogue days the average power was the transmitted power. In the digital world the average power could be well below that of the analogue device, but the peak power well above. For example, the peak power of a digital unit could vary from two to 20 watts, depending on the range, whilst the average power draw is less than that of a normal analogue portable set. The higher power is required due to the range and the boundary conditions for operation of a high quality digital service. Similarly for the digital systems, the use of time-based modulation schemes means that the harmonics generated at each transition are richer than those of the older continuous systems. This in turn increases the potential for coupling peak pulse energy into specific areas of resonance in the body, particularly in the near field of an antenna at harmonics of the water vapour line.

With a mobile radio wavelength of around one third of a metre it is not hard to see that soft parts of the body such as the eyes are within the close couple range when units are used, as normal cellular telephones are, with the aerial next to your ear. Obviously there needs to be careful consideration given to the peak heating that can occur with some power levels, despite statements assuring the user of safety that have been made by Austel and others. These may need to be weighed against the long-term exposure to such radiation, the effects of which are still far from understood. Maybe all you have to do is just change hands from time to time!

It seems that in the rush to introduce new technologies we may have been blinded by the simplest of public interest controls, that of the test of no reduction in public benefit against commercial benefit. There appear to be deficiencies in the requirements for initial network infrastructure standards that require the operators to limit the handheld peak power levels to below that for the current handheld analogue units until a better understanding of the long term effects is available. Warm feelings all round, except for the operators . . .

The Minister has already asked the SMA to investigate the interference aspects of hearing aids, so maybe the next independent study could to be to develop safety guidelines for public use of radio units, otherwise in the future you may see vast hordes of ageing one-eyed yuppies with their hearing aids disconnected, former addicts of the technology that provided the warm inner glow. Radio use is generally safe, but lower power is better.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

AC: *With all due respect, Optus has one shareholder that's bigger than . . .*
Beddall: No. But as a second carrier. This is a tariff issue, and the tariff issue is Optus. It's an inquiry that Austel has accepted, rightly so in my view, to have a look at the rapid growth in the reseller market which has been quite extraordinary.

AC: *I understood that resale competition was one of the aims of the original framework which is why resellers entered to operate here?*
Beddall: But I don't think it was the evident intent that because Telstra was limited to a certain tariff, it would lose rapid market share by leased lines when it can't actually compete.

AC: *The upset from some parts of the industry is that they have to stop leasing lines, in effect, until March.*
Beddall: Well, the maximum of March. Let's hope Austel's inquiry is quicker. The reason we have Austel is to handle these issues very clearly, because you do have a dominant carrier that is not allowed to act as a dominant carrier.

AC: *There may be some confusion on what government policy is given Mike Hutchinson's statement.*
Beddall: Well, Mike Hutchinson can issue a statement. It's the Minister who issues statements, and I don't know what the Minister of the time said.

AC: *As Minister earlier this year, you issued a direction to Austel during the preselection negotiations? Is that correct?*
Beddall: I issued policy advice, policy clarification. I can't issue instructions to Austel, but I can define government policy. I would never issue a direction to Austel because that would be in breach of the Act. It is my role to define what government policy is to Austel, and for Austel to take that into account.

AC: *The first many of us heard about this was when an Optus lawyer read from your letter at ATUG '93. He was obviously regarding it as public property. At that stage, I understood that it was a direction.*
Beddall: No. It was clarification of general policy.

AC: *This was on the issue of preselection for Easycall?*
Beddall: Yes. On that particular issue, the view was expressed that it was government policy that there be full and open competition, the same as we've made a decision in relation to Flexiplans.

AC: *I assume this policy advice will be public at some stage because the result of those negotiations was for Austel to conduct a study of centrex and preselection.*
Beddall: I don't know. I wrote to Austel. I didn't write to the Australian public.

AC: *Did your advice follow representations from Optus?*
Beddall: It followed discussions with both carriers. My role is, in some ways, a difficult role. I'm the shareholder of Telstra. I'm also charged with ensuring that through Austel there is fair competition and that market dominance isn't a method for destroying the second carrier.

The Government made a very clear decision that what we would have for five years is a competitive duopoly, and that's why it comes into other areas such as the reseller market. Optus has paid $800 million for its licence and rolled out a network.

AC: *Optus got a satellite system too . . .*
Beddall: Its capital investment is over $2 billion. If someone spends $50 or $60 million, which is a substantial investment as a reseller, is that the same as someone who has paid $2 billion to roll out a network in a five year timeframe? Optus has to position itself that in five years it can be open to all competition. All of these other players had the right to bid for a full licence.

AC: *In response to this Austel inquiry, I've sensed a worry within the industry about changing the rules midstream.*
Beddall: I wouldn't think we've changed the rules midstream. But if market forces indicate that the intent of the original decision has been circumvented in some way, then I think the Government has the right to restate its policies.

AC: *How do you balance the competing interests of Optus, Telstra, the service providers and consumers?*
Beddall: They're jumping at Austel rather than me. My view is, and I've said this to both carriers, that if they're both complaining about what Austel does, then maybe we've got the right balance.

AC: *And you mentioned legislative changes for Flexiplans. Not everyone loved you on that either.*
Beddall: To be loved by everyone means you're not doing a good job! My view, and the Government's view, is that that type of arrangement was always intended in competition. Both Optus and Telstra can offer Flexiplans. The area of concern, and this is where we've given more power to Austel, is in the bundling of services and making an anti-competitive package. That's where Telstra is unhappy. Optus is not happy either. But both carriers accepted the decision quite readily.

AC: *You seem to be on top of these issues. To what extent do you accept Departmental advice on things like Flexiplans?*

Beddall: Well, we consult with the carriers. In that particular case, I directed the Department to consult not only with the carriers but all the resellers, and then come back to me with a series of options.

AC: *Did you receive much flak on the ballot? Though it was really a decision for Austel, it was the Government that opted for preselection.*
Beddall: Yes, the Government decided preselection. I don't hide behind pride of my time. When I became Minister, both carriers were committed to it. Some people said to me: 'You should stop the ballot,' and I said: 'I should change my name from David to Solomon.' I had both carriers saying they wanted a ballot.

AC: *Do you think the funds spent on the ballot could have been better spent?*
Beddall: A large proportion of the advertising campaign is not only aimed at getting a vote for Optus or Telstra, but at making a phone call to Hong Kong for Chinese New Year. It's about generating income as well. They're growing the market. We have very low line utilisation in this country, which is quite surprising. There's a lot of capacity out there. So when Optus and Telstra offer $5 for five minutes to the UK, Hong Kong or wherever, usage rates go right through the ceiling. It's a hangover from when it was so expensive to make long-distance calls. A lot of that advertising has been very good for the carriers, so it's cost-effective.

AC: *In future it seems that we're going to see the Brisbane Broncos endorsing Optus?*
Beddall: That's a marketing decision. Both carriers courted the Broncos. I actually was in the Telstra box when it was announced!

AC: *As a Broncos supporter, can we assume that doesn't mean you are supporting Optus?*
Beddall: I'm independent. I'll go to anybody's box at the football!

Liz Fell is a freelance journalist based in Paddington (NSW).

a framework of legislation by the end of 1995. Then we've got two full years, if possible, so when the new players come in, everything is quite clear. On 1 July 1997, the duopoly finishes. What's the regulatory framework? We haven't got one. What's the role of Austel? Is it an expanded or diminished role?

AC: *The Hilmer inquiry had something to say about that.*
Beddall: The Hilmer inquiry is part of that as well. There was always going to be a review in 1994 of the duopoly. The way I see it, rather than the way the Department sees it, is that there was a requirement for the review of the duopoly. Is it effective? I think you can almost say now: 'Yes, it is effective. It's competition.' What I want to do is take the automatic review in 1994 and broaden it so we can then look at the post-1997 regime because the Department may have a view but politicians have to look at the cycle. We're due for election in 1995-96, and what I want to get in place is a regime that when we go into the next elections, there is no delay there on July 1 1997.

AC: *It sounds clear when you explain it. But there must be a real danger of these government inquiries falling over themselves given the Optical Fibre and Futures inquiries plus the Department of Industry's Audiovisual Task Force and Arts has consultants looking at new technologies and TV?*
Beddall: All I can do is act as Minister for Communications and my responsibility is in the communications area. It's a fascinating area.

AC: *Given the age-old tensions between Ministers and their departments, would you see yourself as having taken control of the agenda from the Department?*
Beddall: I don't think the Department ever had the agenda. The Department gets good and bad press, but it has brought in a very good competition regime which involved cooperation between Ministers and the Department. I think the duopoly is one of the best models I've seen, and I've looked at other models. I think the US model is an example of a disaster. I think we've done the progressive duopoly very well.

AC: *The Department on behalf of the Spectrum Management Authority [SMA] is now seeking consultants to advise on the tendering for MDS spectrum. Did they talk to you on that?*
Beddall: Yes. In light of the history of the MDS tender, we want to make sure that the next process is bullet proof.

AC: *You mention the history. I noted in the Pearce Report on MDS, that the account didn't extend back to the earlier disasters in 1986. After seven years on this, doesn't it raise questions about levels of knowledge and experience?*
Beddall: Let me put it this way. What I want to ensure is that the process for the MDS tenders is as bullet proof as possible in view of the recent history.

AC: *Are you going to revamp the Ministerial Advisory Committee [MAC] that helped guide the telecoms restructure?*
Beddall: I intend to. I've already had discussions with the Chairman of the Caucus committee, Leo McLeay, and I would think he will chair the MAC. I don't want it to be seen as another inquiry, rather it would offer an overview and give advice to the Minister.

> *"I can't issue instructions to Austel, but I can define government policy. I would never issue a direction to Austel because that would be in breach of the Act. It is my role to define what government policy is to Austel, and for Austel to take that into account."*

AC: *I notice that you have already set up a Broadcasting Industry Advisory Council. Will they overlap?*
Beddall: That's just broadcasting: the ABC, SBS, FACTS, FARB, and so on.

AC: *But the industries are merging?*
Beddall: Well, they haven't merged yet! And broadcasting, whether it's by cable or airwaves, has always had very specific broadcasting issues about codes of practice, advertising content, quality of programs allowed at certain times. It's a forum for me to talk to the industry players.

AC: *There seem to be many different bodies.*
Beddall: My style and history as a Minister is to consult as widely as possible then, in the end, you do what Ministers have to do, make decisions. You don't necessarily have one source of advice. You need alternate sets of advice. I have a very good relationship with the Communication Workers' Union, because I think they have an insight into policy other than just being the union representative of workers.

AC: *You have a number of reports from Austel awaiting action. When will you make some decisions on these?*
Beddall: Which ones in particular?

AC: *The Privacy Report, the Rural and Remote Report, the Payphones Report.*
Beddall: The Privacy Report is with the Attorney-General at this stage.

AC: *Are you exerting pressure to speed it up given that it was finished about nine months ago? For instance, the recent problems with the Reverse Phone Directory may well have been avoided? When can we expect some action?*
Beddall: That's a question for the Attorney-General.

AC: *What about the Rural and Remote Report? I understand you have actually been around some of those areas.*
Beddall: Yes. I've consulted with the players at the grass-roots level.

AC: *If I read the report correctly, there was a couple of recommendations that required an OK for Austel to proceed.*
Beddall: One thing we had to do with Austel was get it back to full strength. It's only a three-person Board, so if you're operating with two, that's a disadvantage.

AC: *While you were away, Austel has created considerable upset in the industry . . .*
Beddall: In some sections of the industry.

AC: *. . . in some sections of the industry over the International Service Providers licence and double-ended interconnect? Did you receive representations on that?*
Beddall: I was aware of the issue. The correct procedure was for Telstra to refer it to Austel and to convince Austel to do the inquiry. Austel has now accepted that inquiry, and what it has said is that there will be no more leased lines, but they can operate the ones that they've got.

AC: *That, of course, is what is upsetting some resellers. It means, effectively, they must sit still until Austel's report in March, which allows Telstra and Optus to move ahead and garner all the traffic they can.*
Beddall: There are two issues. One is that Telstra and Optus are the carriers and if leased lines are in competition with the carriers, then maybe that's an issue for Austel to look at.

AC: *Wasn't that the intent?*
Beddall: No. Not if you are getting a very substantial large amount of resellers. The other argument is reciprocity between the markets of the players here, and Australia getting access to those markets.

AC: *But Mike Hutchinson announced two years ago that all international resale services would be regarded as being in the public interest. Now Austel is investigating whether they are in the public interest.*
Beddall: Don't forget that we could actually fix that problem in terms of Telstra and Optus tomorrow. We could say to Telstra: 'There's no price ceiling on international phone calls.' It's Optus that Austel is protecting against the dominant player.

AEEMA, to everybody — they always said that before you go out and lay the fibre, find out what you need and what broadband services are required in education, in business and in the home, and what is the best way to get to that. The inquiry may say full fibre, or fibre to a certain point using one of the remote integrated multiplexers that Telstra and Alcatel have worked on together where you get fibre to a box and then 500 houses on coax, or it may be ADSL.

I talked with Wharf Cable in Hong Kong about ADSL. They are going MDS first and then full fibre in three years, but there you go to one building with 1,500 subscribers. They said that if ADSL was quicker, then maybe it could be an interim solution because you don't need 100 channels and 30,000 simultaneous phone calls to every house.

AC: *Returning to the political issues, I understand that it was Jamison's approach to Senator Button that led to Prime Minister Keating raising the idea in his election speech?*
Beddall: I'm not aware of that. I wasn't in the portfolio.

AC: *What sort of role do you see the private sector as playing?*
Beddall: There'll be a role in making submissions to the inquiry . . .

AC: *But when it comes to the construction?*
Beddall: I can't pre-empt that. Obviously some people have a view that we should let them lay the fibre now . . .

AC: *'Them' being?*
Beddall: 'Them' being a private consortium who would lay the fibre from the pillar to the home and then all of a sudden they own it. We've always said that's owned by a carrier.

AC: *And that could pre-empt a decision on the privatisation of Telstra?*
Beddall: The issue of privatisation is not on the agenda. And neither should it be at a time when Telstra is preoccupied with fighting a ballot. Even Frank Blount is on record as saying the ownership issue shouldn't be on the agenda while you're determining market share.

AC: *I understood that before the elections the Department doled out money for consultants on privatisation.*
Beddall: Maybe it was being a good Department providing advice to all potential Ministers! They haven't ever shown me that, and I haven't asked for it.

AC: *How important is it for the Government to protect Telstra's value given privatisation is still on some people's agenda?*
Beddall: It's not on my agenda. By introducing competition, what you have already done is diminished the shareholder's value. Even if Optus only got one per cent of market share, and it's obviously going to get more, it will diminish the value.

So what the Government has said, I think quite rightly, is that we would not constrain Telstra in growing its business. That's why on the issue of convergence, we've allowed it, and quite happily from my point of view, to buy 10% of Channel Seven. As communications and media merge, you need to develop skills and Telstra has no broadcasting skills. What it will have is a board member on Channel Seven and therefore it can develop those skills. It's a very good strategic investment, apart from being a very good business investment.

"So what the Government has said, I think quite rightly, is that we would not constrain Telstra in growing its business. That's why on the issue of convergence, we've allowed it, and quite happily from my point of view, to buy 10% of Channel Seven. As communications and media merge, you need to develop skills and Telstra has no broadcasting skills."

AC: *I assume the Government and yourself don't want to reduce Telstra's value further?*
Beddall: No. That's why we're encouraging it to go offshore to look at opportunities in the Asian-Pacific region. Part of my overseas visit was to restate in Asian countries that Telstra is to be a player. It's a very substantial player in Vietnam, the growth in traffic out of Vietnam is quite spectacular, and we've just announced another large investment there bringing it to $250 million. So it's already a player and it's looking for opportunities in Malaysia, Indonesia, Hong Kong, the Philippines and a whole range of places. That's how you grow the shareholder value.

AC: *Another issue is whether Telstra should be engaged in both carriage and content such as Pay TV. I've heard people refer to that as reinstating 'monopoly by stealth'?*
Beddall: Optus can do exactly the same. There are no restraints and, after 1997, so can anyone else.

AC: *The combination of Telstra, the TV networks and Murdoch in the PMT consortium is very powerful. This is probably why some people talk of the 'reinstitution of monopoly by stealth.'*
Beddall: But Telstra is only part of a consortium. This is the difference so many people have missed. What we have consistently said is that in any fibre network etc., there has to be equal access for other players.

AC: *So that wouldn't stop Telstra providing services?*
Beddall: It would always have to provide equal access. PMT is another business enterprise like phone books or whatever.

AC: *Why do you need another Communications Futures study covering what seems to be similar areas to the Optical Fibre Expert Group?*
Beddall: It covers a whole range of other areas as well. The Optical Fibre inquiry is a specific election commitment we are honouring. One thing that can be said about this portfolio is that it changes so quickly. If you just wait for change, it will overtake you. We're doing this [study] with the Bureau of Transport and Communications Economics [BTCE].

AC: *It's the Department really isn't it?*
Beddall: Yes, but the core of the work is being done by the BTCE. We've a steering committee made up of people other than the Department.

AC: *Just one other person, as I understand it, and it's headed by the Department's Mike Hutchinson, whom many regard as very powerful. It makes one wonder whether this is the Department's attempt to pre-empt the Optical Fibre inquiry?*
Beddall: Not in my view. They are complementary.

AC: *Did the Department suggest it to you?*
Beddall: No. More correctly, the other way round.

AC: *So you suggested the Department get involved?*
Beddall: I said to the Department when I became Minister that we really had to look at where the future is going, because we're talking about fibre but there's a great change in the technology of wireless. We can't afford to sit back and wait to see what technology arises without having some foresight. And that's what this is: just looking to the future.

AC: *A new framework for change has been put in place in the last two years for telecommunications and broadcasting. Now the Futures project seems to be revisiting this because of change. Isn't that destabilising?*
Beddall: There are different inquiries. What I also said when I became Minister was that I didn't want 1997 to come upon us and the end of the duopoly without having the regulatory regime in place long before. I've said to the Department, as part of the Futures project, that we should next year start the process of review of the duopoly looking to

AC: *In those industry plans, I presume there are levels of Australian content and so on?*
Beddall: Yes. I haven't got the exact figures, but both Telstra and Optus have exceeded those. I think those targets are available, but I don't have them with me.

AC: *Yet you hear cynical comments from the industry such as does the Australian content include licking stamps?*
Beddall: And does it involve the laying of cable rather than value added? An example of how it does assist through spin-off effects is NorTel, who is a supplier to Optus, in particular, but also to Telstra. NorTel has entered into a strategic alliance with the University of Wollongong and Exicom and is exporting third-party products. That's a spin-off from the deregulated environment.

AC: *Telstra's supply contract is a matter of some concern within the industry. Is this a matter of concern for you?*
Beddall: No. Obviously what Telstra has to do is ensure that it has a state-of-the-art network and that it gets as much digitalisation as it can. It has formed a view that perhaps it has too many suppliers of switches and transmission equipment. So it has gone to all its existing suppliers and said: 'Look, we've got a Future Mode of Operation study, and this is what we want to do, so let's talk.' It's not a tender in the old sense of: 'We want 10,000 switch panels.' It involves progressive talks with the suppliers. But there will always be at least two, at least two, because no carrier is going to rely on one supplier. I think there are three current switching suppliers, so if that goes down to two, those two will get much more work because Telstra is going to digitise the network much faster.

AC: *In the event that Alcatel missed out, and it is responsible for about 50% of export value, could you intervene?*
Beddall: Well, the Government could. But we haven't faced that because it hasn't happened, and there is no indication that it will. The System 12 switch that Alcatel is supplying to Telstra is exported to China. There is an Alcatel plant there, and they still can't meet the demand. China is such a big market. So Alcatel Australia is exporting switches to China manufactured in Australia. And that's what we're saying: We really need to get a better industry outcome, I think we're getting that, and we'll continue to get that.

AC: *Turning to the inquiries coming up, are you in favour of open inquiries so that input and deliberations are public?*
Beddall: Yes. What I have said about the broadband services to the home, the fibre optic inquiry, is that I want an interim report within six months so that report can then be part of future on-going discussions. Among the questions we've got to ask ourselves are: Do we want to lay optical fibre to every home? Do we want to do it straight away? Or do we want a transition where we may go from twin copper to a mixture of ADSL, coax and finally to optical fibre.

AC: *Isn't that a commercial decision for Telstra and Optus?*
Beddall: It is. But Telstra and Optus aren't the only players in this . . .

AC: *At this stage they're the main players.*
Beddall: If it's a $7 billion investment, it really is very much a commercial decision for Optus because its shareholding is not the Government. But the Government shareholder would have to make sure that if Telstra is going to invest $5-$7 billion in a fibre network and technology-drive rather than customer-drive the solution, then that investment could be a drain on national resources and maybe you don't need to do that straight away. Telstra is not arguing that it has to lay fibre-to-the-home straight up. What the inquiry will look at, firstly, is what the demand is. Technology can't drive the decision.

AC: *As Telstra changes to a customer-driven company, isn't it a matter for the Government to trust that it is following customer demand? You're suggesting it may still be technology driven.*
Beddall: No. But there are always conflicting views within any organisation and I have great confidence in the Board, which finally makes the decision, that it would not likely to go into a $5-$7 billion investment without consulting the shareholder.

AC: *But hasn't the decision been made?*
Beddall: No . . .

AC: *Isn't Telstra conducting trials and calling for expressions of interest in equipment supply?*
Beddall: It's conducting trials on fibre, as well as on ADSL and coaxial cable. What it's doing is making an assessment. My view is that we will go to a full fibre-to-the-home network. It's how we get there and the timeframe. The Japanese are going to do it by 2025. That is a huge investment that will take 30 years. So what we're really looking at is probably an interim method of getting there first and it may be a mix of other technologies, with fibre to some homes.

AC: *I've heard the argument that the Optical Fibre Expert Group is an 'unnecessary commercial constraint' on Telstra and Optus, especially since Telstra has just been freed, in some sense, from Government intervention in its decisions?*
Beddall: Well, that's the first time it's been put to me that it's a restraint because the inquiry has been welcomed by both Telstra and Optus, and they think it's the right way because in the United States, Clinton is doing a similar thing.

AC: *But the environment is very different in the United States isn't it? There is a different mix of private sector ownership and . . .*
Beddall: It is all private sector driven, whereas the inquiry is into the fibre highway . . .

AC: *The inquiry must also be related to the fact that the Bell companies are investing offshore rather than at home.*
Beddall: Yes. And we're investing offshore rather than in Australia!

AC: *As Telstra's shareholder, do you have the power through the Board or some other way, to stop it calling for, say, expressions of interest in cabling?*
Beddall: Every decision the Board makes is on notification under the Articles of Association of the company and Article 33 is to advise the shareholder. That's a requirement of the Board.

AC: *Do you consult with the Board?*
Beddall: Yes. It's a good working relationship, particularly with the Chairman. We're very fortunate that David Hoare is a very good Chairman and very experienced businessman. I have a very good relationship with both him and Frank Blount and recently we had a full briefing with the Minister for Finance. Obviously, Finance has an interest because any decision affects the shareholder's dividend. They also independently briefed the Prime Minister. So they take that role very seriously.

AC: *In terms of the underlying political issues, was the inquiry triggered by pressures from the private sector such as Jamison Equity trying to get into the act?*
Beddall: Not in my time.

AC: *But almost in your time because the Prime Minister issued a statement during the elections.*
Beddall: The Prime Minister made a statement. Yes. And then in the Budget Round, I took forward a proposal which was for an inquiry that was funded for $1 million for one year. I'm very pleased about that because when I talked to the industry — to

David Beddall — Balancing Converging Interests

David Beddall, MP
Minister for Communications

David Beddall was appointed Minister for Communications in March this year on the re-election of the Labor Government. He was first elected to the House of Representatives in 1983 and is currently Member for Fadden in Queensland. Before entering Parliament, he was a consultant specialising in the financing of equipment and purchases for small to medium sized business. His previous portfolio responsibility was Small Business, Construction and Customs. He spoke with Liz Fell in Sydney on his return from leading the first telecommunications industry mission to Asia.

Did you manage to lift the value of Australian exports during your recent Asian-Pacific mission?
Beddall: That question is best answered by the companies on the mission. Certainly, at each point in the mission, we had a debrief where people expressed a couple of clear statements. One was that they had established a number of leads, and also the fact that the Minister had led the mission opened up doors for them. Even people who had been in those markets for a long time got access to decision-makers and bureaucrats that they couldn't possibly get otherwise.

AC: *With your long-term interest in small and medium business, was this group well-represented on the mission?*
Beddall: Very well-represented. We had people from Telstra, which is the fourth biggest Australian company, through to small consulting and engineering firms and people involved in remote area communications. It was the full spectrum of business including Australian-owned, transnationals based in Australia and small and medium sized players. One other benefit is that when you're travelling together for so long, that New Age 'bonding' happens: the smaller players got to know the bigger players better and vice-versa.

AC: *What about you?*
Beddall: I've always had the view of these types of missions that basically the role of the Minister is to be the team leader, to facilitate. I attended virtually every meeting, and at all the large meetings I was the chairperson. We had a set format where if we met a Minister, I would ask them to introduce themselves in 15-20 seconds: who they were and what they did. The other thing was the Capability Document.

AC: *Did that document cover all Australian companies?*
Beddall: The mission arose out of a request by the industry Export Group. The Capability Document lists all those companies as well as those on the mission. It's very well done. They developed a very good logo which shows Australia at the centre of Asia.

AC: *Did they change the map?*
Beddall: No. If you look at, say, Jakarta and Kuala Lumpur, then we are closer than Japan and Korea.

AC: *Roger Knight from Austrade has argued it is important to distinguish between country and company because exports are about generating wealth for Australia and that may not be the case when profits are repatriated.*
Beddall: That's true in a sense, but it's the generation of jobs and wealth that stays here. The Export Group has set itself a target of $1 billion worth of exports by 1996-97. It exported $360 million last year, and it is $500 million this current year, so the $1 billion target is now considered to be quite low. That's a huge growth in exports from virtually zero three years ago to $500 million this financial year. They're on an exponential curve.

AC: *That raises industry policy. I understand that TIDA [the Telecommunications Industry Development Authority] is to report on its monitoring of carrier plans to you?*
Beddall: It reports to Alan Griffiths, but with copies to me. TIDA was set up by John Button originally, so it reports to the Industry Minister, but at the same time it reports to me and I've had a meeting with TIDA.

AC: *At the opening of the new Alcatel facility recently you said that through these industry plans, carrier commitments have had major benefits for investment in manufacturing and R&D. Are you going to make these plans public?*
Beddall: The broad outlines are there. They are not a Mickey-type plan.

AC: *But we don't know that.*
Beddall: Well, I'm telling you they're not! We don't have a specific: 'You must export $20 million this year.' They're targets and TIDA reports to Alan Griffiths. In the past, the Department of Transport and Communications really saw itself as the regulator, getting the framework right, and not so much in an industry role. But I encouraged James Barr, the Head of the Department's International Branch, to come on the mission.

What must be understood is that whilst we do have a very good regulatory regime, flowing from that regime are competitive domestic carriers who are internationally competitive and therefore their suppliers are internationally competitive.

AC: *Returning to the industry development plans, do you have carriage with the Industry Minister?*
Beddall: I've got carriage in the sense that Telstra reports to me as its shareholder, so there is an advantage for Telstra in that it has only one shareholder. The disadvantage, of course, is that it's a government shareholder in the sense that it's not a public company. So it reports to me and to [Finance Minister] Ralph Willis.

AC: *And Optus, in terms of its industry plan licence conditions, reports to . . .*
Beddall: To TIDA and to the Department of Industry.

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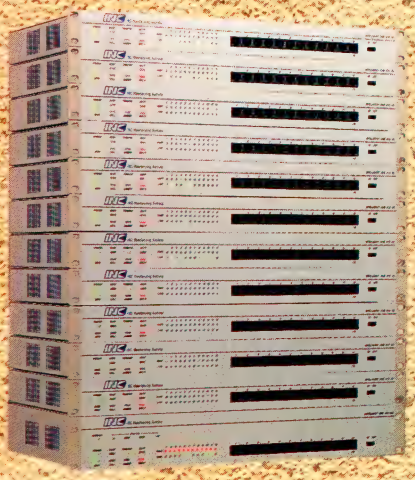

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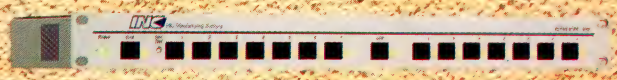

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'may be less important than certainty regarding where responsibility lies for the quality, reliability, maintenance and repair of the telephone service.' The CLC also expressed concerns as to whether Telecom's USO could be met if the property boundary was nominated.

In relation to the more difficult multi-tenanted residential building situation, where typically occupants are served through a MDF, Telecom favoured the MDF, while Optus preferred the MDF as a starting point, with customers having the option to have the NTP located inside the MDF. The Communications Workers Union felt that with the growing complexity and range of network-based services on offer to business users 'there is a plausible argument' that the NTP may need to be beyond the MDF. In the case of residential properties they felt that each tenant should be provided with individual carrier-provided service on the basis that without that service, greater charges may accrue to customers, some of whom may be the least able to afford those charges.

In relation to commercial premises, of those that expressed a view, most felt that the status quo should be retained, some indicated that the BEP would be preferable, and only a couple opted for the property boundary. ATUG felt that the property boundary would not meet some customers' security criteria nor meet the requirements of the carriers. One concern of Optus in this regard was that competition in the provision of special services to businesses in multi-tenanted buildings should not be inhibited. After seeking views from overseas, 21 out of 24 authorities indicated that the BEP is preferred in 12 North American jurisdictions, the current Australian status quo is preferred in six European countries, and three jurisdictions preferred the property boundary, but also provided for circumstances in which there was scope for negotiation by the customer.

Customer Flexibility

The single residential or commercial property presents few problems if the NTP is to be set at the BEP. It is the multi-tenanted building (such as in the CBD or in a city residential area) where the situation becomes more problematic. A number of submissions suggested that flexibility would be required. Austel acknowledged that carriers justified some instances of MDF by-pass as they claimed to be unable to guarantee the quality of their service or security, although in doing so Austel felt that their concerns could be adequately addressed. From the remainder of the draft report this would appear to be by way of voluntary Austel standards under AS3080. Austel's primary focus was more concerned with definitions, in that any mix of customer network cabling beyond a building entry point was said to blur the boundaries of what was prescribed to be the BEP, and raised issues as to responsibility for cabling, its maintenance and record keeping.

The draft report's Finding 15 is probably the most interesting. It states that the 'location of the NTP at the building line is more practical to implement, more widely favoured and more beneficial to customers . . . customers should be provided with some flexibility in particular circumstances to enable them to choose an alternative NTD location that meets their needs.' This may well turn out to be the safety valve that enables the BEP to be practically suitable as the demarcation point.

Unanswered Questions

In setting the BEP as the boundary, Austel is raising the curtain on a number of previously hidden issues. It is unlikely that the simple act of 'drawing a line in the sand' will dispose of the problems. The legal status of carrier-installed cabling has never been clear, and to an extent has been an issue kept under the carpet. In one view, the cabling may be a fixture, and therefore owned by the building owner, but there is judicial authority that certain cabling and telecommunications equipment will be goods and therefore not fixtures. In relation to carrier-installed facilities, Section 123 of the *Act* provides that the carriers retain the right of property in carrier cabling, and it is uncertain how this will fit with Austel's intentions. Telecom has also asserted that it owns certain internal cabling installed prior to 1 January 1989 in some States but not in others, and Austel has also asked for submissions as to how those claims should be addressed.

If the building owner is now logically (as well as possibly legally) deemed to be the owner of cabling beyond the NTP (one of Austel's suggestions) and of associated equipment, such as the ASTE, then certain issues arise:

- Will building owners have to assume responsibility for ensuring compliance with Austel's infrastructure and cabling standards?
- How will customers who are tenants of the building owner ensure that there is sufficient capacity for their needs; that dedicated cabling can be installed and left as dedicated cabling; that there is sufficient capacity in the backbone system if there is no dedicated cabling; and that carriers or other maintainers have sufficient access to common facilities to enable maintenance and upgrade to take place?
- Who will be responsible for ensuring maintenance standards and fault repair on the non-carrier side of the NTP — will it be the building owner? How will customer-preferred security levels be met?
- How will compliance with equipment standards and cabling be enforced, and will this lead to the possibility of liability and prosecution against building owners and/or customers?
- How will customers deal with building owners (and vice versa) where unreasonable cost advantage is sought?
- How will customers and building owners be educated as to their new obligations and the differing roles of carriers?
- How will Telecom's universal service obligations work now that a third party is to have control of facilities on the non-carrier side of the NTP?
- Will there be any rules requiring that a building owner allow other service providers to install cabling if, for example, there is a capacity 'lock out' arising when other customers are utilising capacity provided by another carrier? Will there be rules to ensure that this does not occur?

Building owners have already expressed concerns as to the likelihood of increased administrative costs and record keeping, liabilities that may accrue if cabling is destroyed or damaged or if backbone cabling is faulty or inadequate, and the costs of removing cabling. Other concerns include the possible need to update pre-existing backbone cabling to comply with changing Austel standards and market requirements in the future, liability if there is a failure to provide infrastructure, and maintenance costs.

Public Awareness

Austel may well now need to adopt a more active monitoring role to safeguard customers from sharp practices. More importantly, it will have to ensure some kind of public education campaign. It is probably unfair and unrealistic to expect that consumers and end users will quickly come to grips with the changed regulatory environment when even Austel and leading industry experts are having difficulty in resolving so many of the issues that arise.

In March this year, *Legal Line* concluded that the clear message seemed to be that the NTP must have a real, tangible point and not merely a regulatory function. It also concluded that placing the NTP at the property boundary may be costly, inconvenient and confusing to customers and carriers alike. Although Austel has now quite convincingly shown that the BEP rather than the property boundary should be the NTP, many of those same concerns still apply and will require careful consideration, particularly if Austel is to be seen to fulfill its competitive charter.

Chris Woodforde practices with the Sydney technology law firm, Gilbert & Tobin, specialising in telecommunications and information technology contracting and regulation. This column sets out his personal views and not those of clients of the firm.

Network Termination Point: Slings and Arrows of Fortune

Austel intends that the network boundaries be designated as the building entry point. Chris Woodforde discusses why service providers, building owners and customers should take careful note.

Austel published its draft report to the Minister on the network boundary in July this year. Since then, Austel has held public seminars and called for submissions, which were due by 31 August 1993. What is clear is that the industry is in for a more uncertain time as tenants, building owners, carriers and service providers come to grips with a more complex cabling environment.

At present, the network boundary, or network termination point (NTP) is defined under the *Telecommunications Act 1991* as the last telephone socket or Main Distribution Frame (MDF) in a multi-tenanted building. Austel has indicated its intention to roll back that boundary to the building line. In doing so, Austel considered but eventually discarded the previously expressed policy of the Federal Government that the network boundary should be at the property line.

Austel has, however, taken up the baton handed to it by the Government in focusing on the enhancement of customer choice and competition.

The NTP delineates the boundary of the rights of the general carriers as primary providers of Australia's line-based and satellite capacity. The subsidiary function of the NTP is therefore to mark the point at which open competition commences and the carrier reservations stop. Beyond the NTP, cabling and equipment becomes 'customer equipment' or 'customer cabling' which is open to competition and, unless installed by the carriers, the *Telecommunications Act 1991* is silent as to whether the customer or some other person should own that equipment and cabling.

The consequences of designating the building entry point (BEP) as the NTP have yet to be fully worked through. Perhaps the clearest message to emerge, however, is that carriers may no longer be expected to ensure end-to-end service quality, fault location and repair, maintenance, upgrading and security guarantees in the same way in which these services have been provided in the past. Quite how Telecom's universal service obligation (USO) is expected to fit in over these considerations is also unclear (the USO requires Telecom to provide reasonable access to standard telephone services to all people in Australia). Austel acknowledged that as a practical matter, current practices of using network termination devices (NTDs — such as single line residential network termination devices or MDFs) should continue. Where a NTD is appropriate it is to be located at, or in close proximity to, the building line and be recognised as the NTP. Where a NTD is not appropriate then the building line will be the notional NTP. The terms of the draft report indicated that all cabling and equipment on the customer's side of the NTP will be deemed customer cabling or equipment (a point which will impact on pre-existing views as to Telecom's ownership or responsibility for cabling and equipment) and will, as a result, be open to competitive installation, supply and maintenance. This is said to include active service termination equipment (ASTE) which the carriers felt should either be included as part of an 'island reservation' to the carrier network or as the NTP demarcation.

Austel felt that some existing practices under which customers could negotiate a NTP that was not at, or close to, the building line were beneficial. Examples included the location of the NTP at the property boundary in the case of industrial estates, caravan parks and the like. Austel specifically reserved the issues of transition arrangements and ownership issues and asked for further views.

Over 38 individuals and organisations made submissions, and many drew distinctions between residential and commercial applications, a distinction which Austel endorsed. The submissions covered a range of preferred options for the NTP, but what was clear was that of those that expressed a preference most did not support the property boundary as the NTP for commercial or residential applications. Interestingly, many of the concerns raised by the submissions may still apply if the BEP is nominated as the NTP.

In relation to residential customers, some submissions, such as the that of Communications Law Centre, put forward the view that for many residential customers potential efficiency and cost savings

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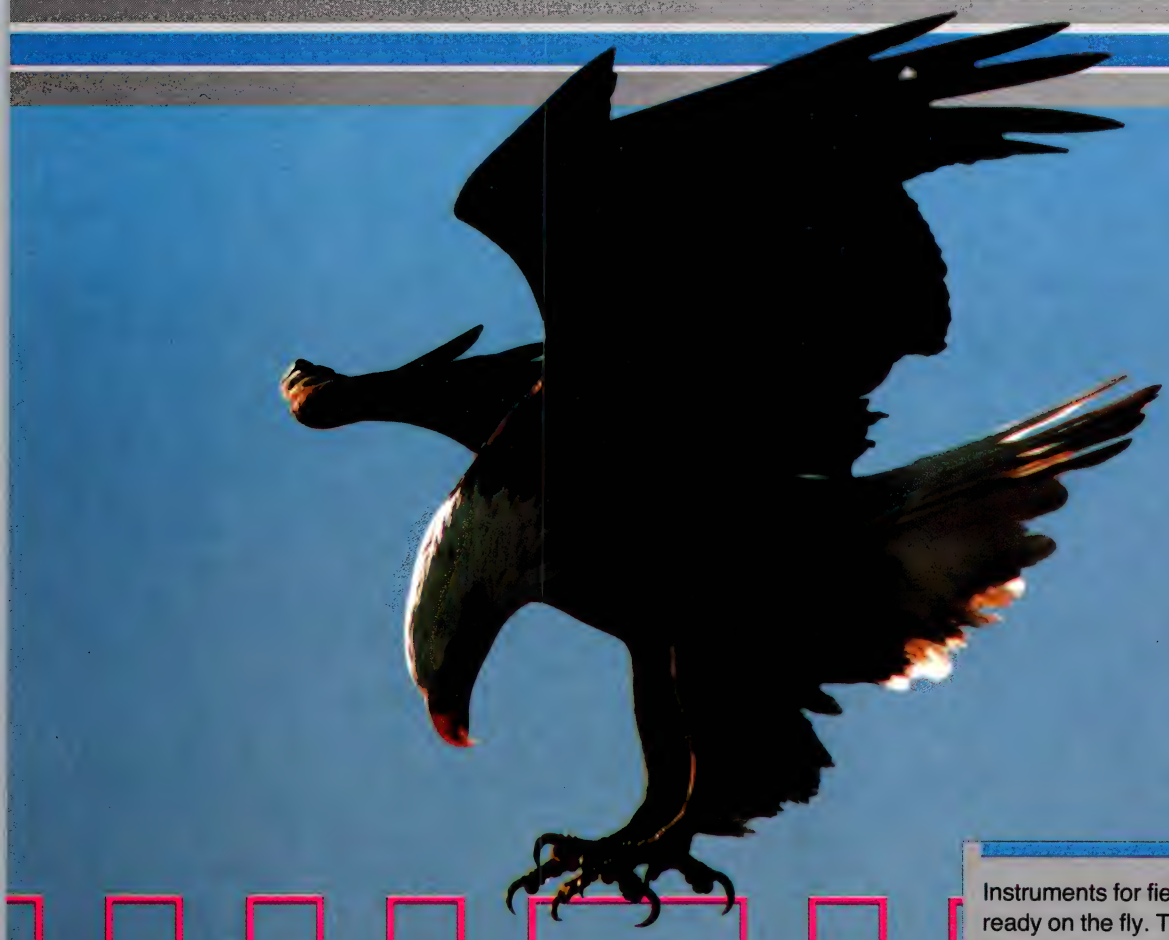

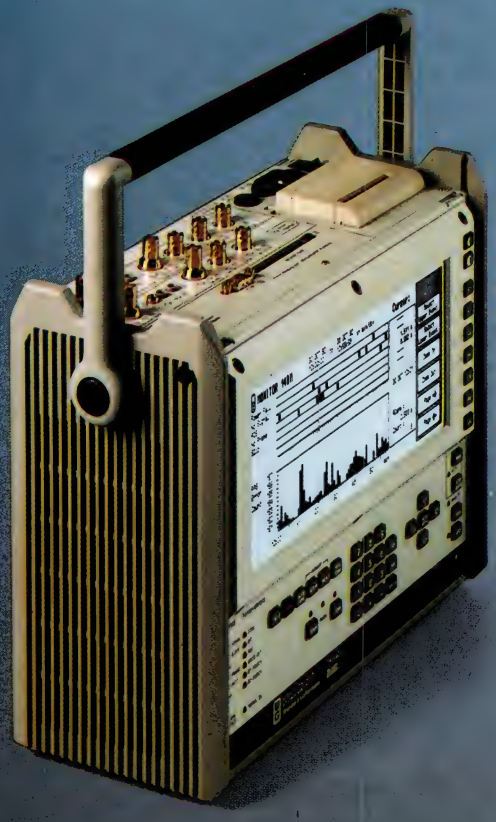

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Feature Set Spells Flexibility

The Time/LAN Enterprise Router from Ascom Timeplex marks the vendor's debut into the high-end router market.

With its new Time/LAN Enterprise Router, Ascom Timeplex makes its debut in a high-end router market that has been dominated by two vendors — Cisco and Wellfleet. The newcomer has the speed and reliability to make it a natural for central sites and collapsed backbones, but Ascom Timeplex should also be credited with some heads-up design.

For one thing, the Ascom offering is the only high-end router on the market to couple a distributed architecture with a high-speed switching bus; for another, its processing power comes in the form of slot-in routing cards that can be added as needed.

The distributed architecture is key to the Enterprise Router's flexibility. The router can accommodate up to 15 cards, called Independent Routing Processors (IRPs), each of which is loaded with its own i960 processor and four line interfaces. The IRPs actually handle the packet processing and routing. Other vendors of high-end boxes also rely on distributed architectures and multiple processors, including Crosscomm.

The IRPs communicate over a five-channel 1.9Gbps switched matrix packet bus (each channel has 384Mbps). Channels are allocated on a packet-by-packet basis, so if one channel fails, subsequent packets can take an alternative path. When an IRP is sending data, it controls the channel for the time it takes a single packet to reach its destination. This scheme makes the Enterprise Router highly fault-tolerant. Routers that rely on a common backplane can be knocked out of commission if the internal bus fails — this could be a disaster if the router has been configured as a collapsed backbone.

The switching bus also enables network managers to configure concurrent paths through the router. Time-sensitive applications, such as airline reservations and credit card verifications, can in effect have a dedicated router at their disposal.

The device can deliver an aggregate throughput of up to 300,000 packets per second (pps) and a software upgrade is in the works that will boost processing power to 450,000pps. Other high-end routers typically require network managers to swap out hardware in order to boost speed.

Part of this performance comes courtesy of the Enterprise Router's 15 i960 processors. The rest is thanks to a clever software module called a Smart Drive, which reads the destination address of every packet as it enters the router. If that address is in the module's dynamic cache memory, the packet is simply passed to the appropriate output port. If the Smart Driver doesn't find the address, the packet is passed on to the Management and Routing Protocols module, which looks the address up in the Bridge/Route Database and then calculates the best routing path for the packet and sends it on its way. Since the Smart Driver stores addresses and optimal routing paths in its cache memory each time a lookup is performed, the time it takes for a packet to travel through the router is further reduced.

PRODUCT SUMMARY

Name: Time/LAN Enterprise Router

Description: High-end router for collapsed backbone networks that has routing engines with individual processors and a high-speed switching bus

Price: From $30,000

Vendor: Ascom Timeplex, Level 21, 1 York Street, Sydney NSW 2000
Tel: (02) 247 1422

Ride the Express Bus

The Enterprise Router's combination of express packet processing and a high-speed bus means that the unit can shuttle data faster than the WAN links it's connected to. Additionally, the Enterprise Router implements two network management methods that improve performance in IPX networks over the wide area. Ascom Timeplex's way of handling SAP (Service Advertising Protocol) and RIP (Routing Information Protocol) broadcasts, called Remote SAP and Remote RIP, reduces unnecessary traffic by sending status information over the network only when it changes or every five minutes, instead of every 30 seconds as normal SAP and RIP do. Locally attached LANs are updated in the usual way.

IRPs for the Enterprise Router are available in a variety of LAN and WAN configurations. On the local area network side, the vendor sells IRPs for Ethernet, Token Ring, and FDDI. The router supports all common protocols, and all major router-to-router protocols including OSPF, EGP and OSI IS-IS.

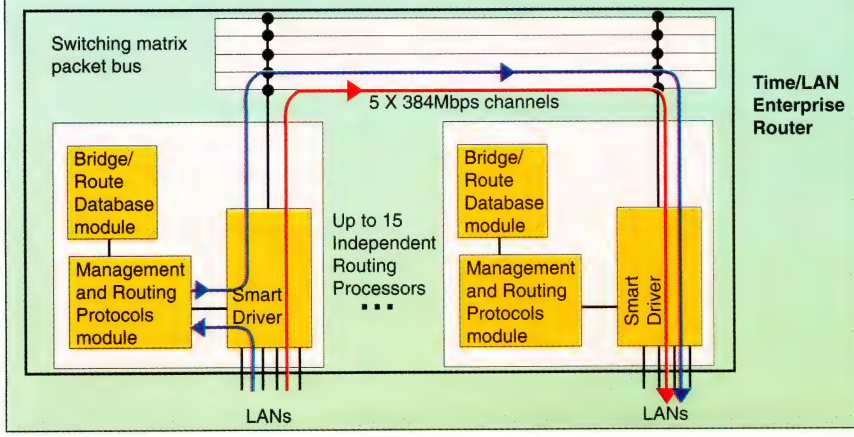
For the wide area, the router handles serial point-to-point circuits at rates up to T1/E1 and connects to public X.25 and ISDN basic-rate interface networks and public or private frame relay networks.

The Enterprise Router has an SNMP agent and thus can be managed by any SNMP system or by Ascom Timeplex's proprietary system, the Time/LAN EMS (Element Management System), which has a graphical user interface for managing the Time/LAN family of products as well as other SNMP-compatible devices.

Salvatore Salamone

Smart Idea Drives Up Performance

The Enterprise Router is outfitted with up to 15 LAN or WAN Independent Routing Processors (IRPs) that transfer data over a five-channel switching matrix packet bus. The IRPs have Smart Drivers that process packets by scrutinising only the first packet to a destination; follow-on packets with the same address are able to take a shortcut, bypassing the Management and Routing Protocols module.



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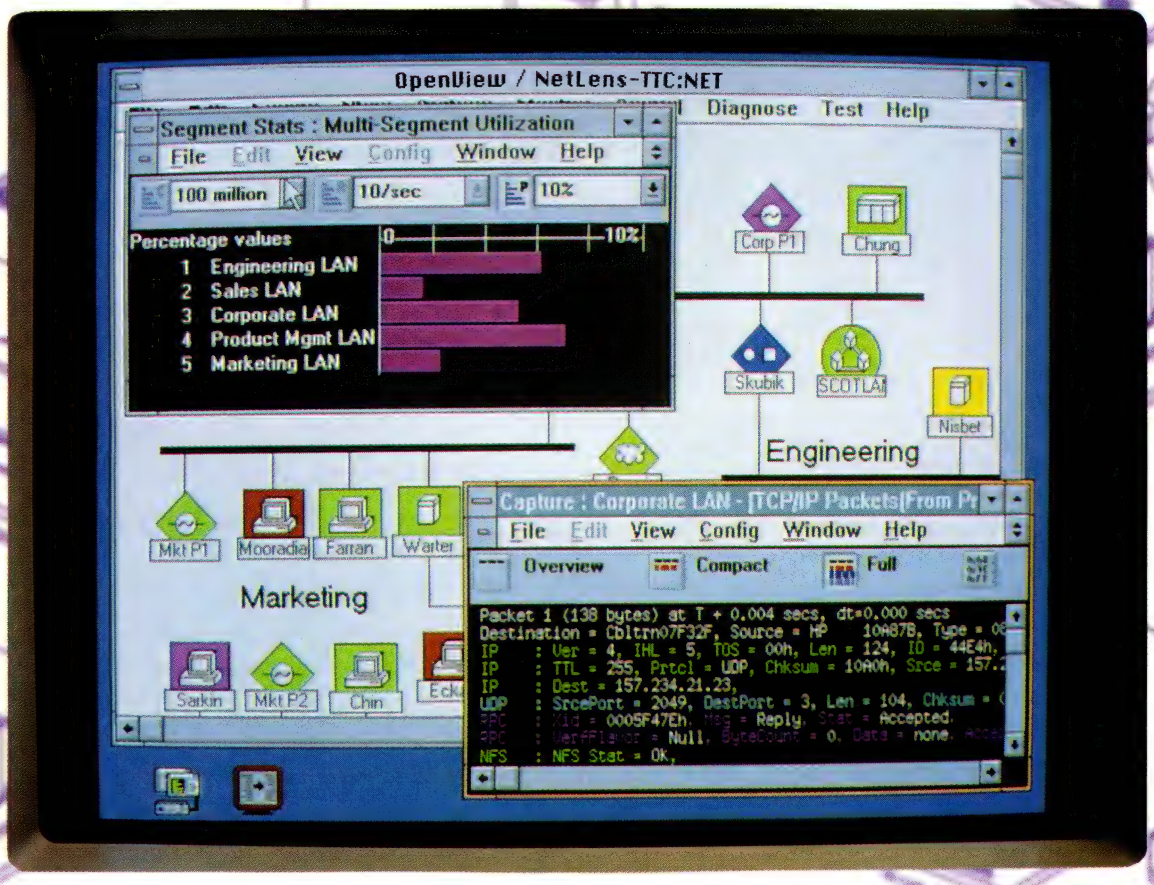

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VICOM

DEC's Switching Hub Debut

Digital's DEChub 900 MultiSwitch connects DEChub 90 users — and offers a migration path to ATM.

Digital Equipment Corporation has been in Australia for about 30 years. For the most part, it has operated quietly and consistently — often to the point of obscuring some of its best products. One example is the DEChub 90. This product was introduced over two years ago yet, on most of the occasions I've had cause to mention it — sometimes to Digital customers — I've found few have heard of it.

Aside from its purely aesthetic appeal this Ethernet-only unit is one of the most elegant, practical, cost-effective and above all idiot-proof products Digital has ever manufactured. The only limitations of the DEChub 90 are that it will not support Token Ring, and does not have redundant power supplies or multiple backplanes which would allow 'private networks' on a single hub. Its backplane bandwidth is also a little on the thin side for future applications (such as ATM). Digital has now resolved all these problems in one go with the DEChub 900 MultiSwitch, which connects workgroups on installed DEChub 90s and provides access to Token Ring and FDDI networks.

The DEChub 900 has 18 'LAN channels' — that is, backplanes — with an aggregate throughput of 3Gbps, and it supports multiple bus, ring and cell-based connections with few restrictions — for example, you can't plug a Token Ring MAU directly into an Ethernet channel. It fully supports all 90 Series modules which can be mixed and matched with 900 Series modules.

The device also incorporates an intelligent power management system with provision for up to four power supply modules, any one of which may be swapped while the hub is running. Each module has provision for a 48V DC power supply in addition to a single phase mains input. The system continually monitors the available power and, in the event of a power supply failing or being removed, will shut down selected network modules. Modules for which the remaining power is sufficient remain on-line. Available power is displayed on the unit's diagnostic display, making it easy to tell at a glance whether or not current power levels will support a new option.

Optimal Options

Option modules released with the DEChub 900 include: the DECrepeater 900 TM, which features 32 10Base-T ports; DECserver 900, a 32-port comms server which supports 115.2Kbps per port, self booting with FLASH RAM option, 4-8Mb RAM and limited modem control with support for TCP/IP, Telnet, SLIP, CSLIP, PPP, TN3270 and LAT; DECrepeater 900 TL and SL 802.5 Token Ring repeaters which extend distances between MAUs/hubs up to 300 metres for STP or 200 metres for UTP, and support 16Mbps over all 100 and 150 ohm cable types; DECmau 900 TL 8-port MAU supporting 4 and 16Mbps over all 100 and 150 ohm cable types; and the DECconcentrator 900 MX 8-port FDDI concentrator, with four ports configurable as A, B or M via software, and which supports single- and multi-mode fibre as well as UTP via plug-in modules which can be mixed.

Digital has also boosted DEChub 90 functionality with the release of the MUXserver 90 and DECbrouter 90, which can provide the DEChub 90 with 12 different modules for the interconnection of Ethernet (10Base-2, 5, T, FA, FL, FOIRL), terminals and WAN links. The MUXserver 90 supports up to 384 concurrent LAT and Telnet sessions, 96 active users and dial-up modems. It can also have up to three DECmux 300s daisy-chained from it. The unit has a single thin Ethernet network connection in standalone operation, and is accessed via its backplane connector when installed in either the DEChub 90 or the DEChub 900.

The DECbrouter 90 is a joint project between Digital and Cisco and supports a variety of network protocols (TCP/IP, DECnet Phase IV, DECnet/OSI, CLNP[OSI], IPX, AppleTalk Phase II, XNS, Banyan VINES, SNA/SDLC), routing protocols (IGRP, Integrated IS-IS, ISO IS-IS, RIP, EGP, BGP, OSPF, IPX RIP, AppleTalk RTMP), bridging protocol (IEEE 802.1d), data links (HDLC, PPP, X.25. frame relay, SMDS), and it can be managed either via a local console, Telnet link or SNMP.

PRODUCT SUMMARY

Name: DEChub 900 MultiSwitch and 90/900 Series Modules

Description: Eight-port, high bandwidth intelligent hub featuring 'plug and play' design, multiple backplanes and redundant power supplies. Optional modules include repeaters, terminal servers, Token Ring MAUs, brouters and MUXs

Price: (ex tax) DEChub 900 MultiSwitch $7,000; DECrepeater 900 TM $3,520; DECserver 900 $8,023; DECrepeater 900 TL or SL $1,759; DECmau 900 TL $1,205; MUXserver 90 $3,233; DECbrouter 90 $4,678 (single port), $6,226 (dual port); DECpacketprobe $4,240; DECconcentrator 900 MX $5,913 (varies with media interface types). Module prices do not include options required for standalone use

Vendor: Digital Equipment Corporation, 410 Concord Road, Rhodes NSW 2138 Tel: 008 021 393

SMNP Manageable

All DEChub 900 modules are fully manageable via SNMP from Digital's HUBwatch software. HUBwatch version 2.0 runs under VMS, Ultrix and Windows 3.x. All this comes in a box roughly the size of a Trailblazer modem.

Digital has also recently released a hardware/software combination called DECpacketprobe — which is hardware — and PROBEwatch, which as the name suggests, is software that monitors network activity via the DECpacketprobe (using SNMP's RMON MIB extensions). Together, this combination forms a powerful local area network analysis tool which may be deployed either as needed or as a permanent network fixture. PROBEwatch runs on a DECstation 5000.

Due to the power and flexibility of the DEChub 900, it is just possible someone might botch its configuration, but I doubt it. If Digital decides to actively market this product range, I suspect that vendors of comparable products will not be enjoying a happy Christmas.

Graeme Le Roux

Life in the FastLane

Scitec's new FastLane product line can cut remote office access costs with voice/data integration.

For many companies, one of the most costly features of doing business in a large country such as Australia is the need to maintain numerous offices in sparsely populated areas. And some of the greatest costs in maintaining offices, particularly small ones, are associated with inter-office telecommunications.

For large companies the solution has been to integrate voice and data traffic over dedicated links of various kinds. However this is still expensive — often so expensive that, for mid-size companies (those with recurring telecommunications costs of at least $40,000 p.a. or more across all sites), the cost of voice/data integration is impossible to justify. It is precisely this market at which Sydney-based Scitec Communications Systems has taken aim with its new FastLane family of products.

The FastLane range has two base units: the F5, which is intended for use as a hub, a high-speed feeder or to maintain point-to-point links; and the F3, which is a cut down version of the F5. Both units use frame (cell) statistical multiplexing of digitised signals to permit dynamic bandwidth allocation on a packet-by-packet basis — this is a functionally similar scheme to that used by Micom's Marathon units (see 'Micom's Dynamic Network Server,' *Australian Communications*, September 1993).

The units have a common 3-slot chassis, built-in Ethernet capability, 4 synchronous ports and a backplane bandwidth of 256-Mbps, allowing them to handle up to 5,000 packets per second, which Scitec claims is more than adequate for most users. The F5's synchronous interface is capable of handling data rates of up to 2Mbps (all interfaces can be set as either trunk or port) while the F3 is limited to 128Kbps trunk speeds and only one port can be configured as a trunk. By using a frame/cell based system Scitec claims that it will be able to provide an easy upgrade path to future standards such as ATM and frame relay. Scitec was one of the founding members of the Australia/New Zealand Frame Relay Forum.

The options available for the FastLane base units are: an analogue voice/fax interface in either 2- or 4- port versions and a synchronous data/trunk interface. The units' built-in Ethernet interface provides an AUI port, an on-board bridge which supports the spanning tree algorithm, SNMP management and, on the F5 only, provides IP routing capabilities.

The analogue voice/fax interface cards which provide both 2- and 4-wire interfaces (FXS and FXO, single E&M) and a dynamic Group 3 facsimile interface also feature silence suppression, echo cancellation, dialled-digit analysis and routing, and user-configurable dial-plans with up to one thousand 20-digit numbers. This allows the unit to be interfaced to an ordinary handset or basic Telecom Commander system in the same way the PSTN is, and therefore expensive PABX interfaces are not required. The card also uses Codebook Excited Linear Prediction (CELP) voice compression techniques. The standard analogue voice signal is first digitised using pulse code modulation giving an uncompressed 64Kbps signal. This is then fed through CELP circuits. These circuits provide low bit rate voice coding at rates from 4.8 to 16Kbps with 8 and 16Kbps giving standard voice quality. This is equal to normal 32Kbps ADPCM voice signals.

The FastLane family's built-in and optional synchronous interfaces support trunk speeds of up to 2Mbps (minimum trunk speed is 32Kbps) and are also ideal for applications requiring the allocation of 'fractional' rates — i.e. N x 64Kbps to various separate destinations in a star, tree or mesh topography network of up to 256 nodes. True ISDN B-channel connections will be available in early 1994. When configured as a port, speeds supported range from 300bps to a full 2Mbps. Option cards can be configured with up to four data interface modules to support X.21, EIA530/RS422, V.24/RS232 or V.35. The cards provide encapsulation for any 7E family protocol (X.25, SDLC, etc.) to cell/frame protocols. LAP F error correction is available as an option.

Quality Control

Scitec, which is a publicly listed company, operates in Europe, the US and the Asia-Pacific and is already well known for its Maxima range of high-bandwidth multiplexers. The company had annual revenues of just over $33 million in the last financial year, of which 11% was derived from exports. Scitec's quality control meets AS 3901 (ISO 9001) and both Austel and the National Association of Testing Authorities (NATA) have certified the company's test laboratories to test their own designs for national and international standards conformance.

Scitec's Maxima units and the F5 and F3 bandwidth managers are not its only unique and innovative products. Scitec has also developed an F2-SMDS Protocol Converter which will allow users to purchase from a wider pool of CPE equipment and use all the features of that equipment in Australia.

With its FastLane range, Scitec represents yet another example of an Australian company providing well thought out, reliable products which meet most major market requirements and which are backed up by solid service and support — national, 24 hours, 7 days.

The only issue which might need to be addressed in deploying this product in a wide area network is that its IP routing capability is based on the routing information protocol (RIP). RIP can take some time to converge in a wide area network environment and it is broadcast based. However, it has to be said that the RIP is one of the most common routing protocols in use and networks are using it effectively, so its weaknesses can be tolerated.

Graeme Le Roux

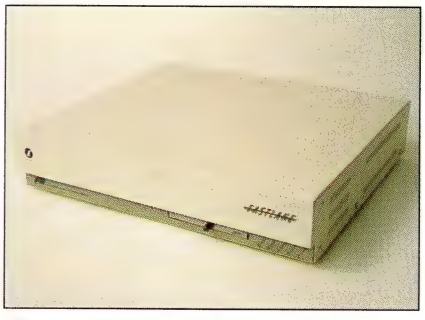
PRODUCT SUMMARY

Name: FastLane

Description: Australian designed and manufactured family of voice/data integration and bandwidth management products

Price: (RRP ex tax) FastLane F5 Base Unit (inc. AUI port and 4 Sync ports) $9,200; FastLane F3 Base Unit (inc. AUI port and 4 Sync ports) $6,000; FastLane Software (for local and SNMP management) PROM version $1,000 or FLASH Card $2,500; Analogue Voice/Fax Interface $2,800 (single port) or $4,600 (dual port); Synchronous Data/Trunk Interface $2,500; Scitec InSight Management Software from $5,000 (Microsoft Windows version)

Vendor: Scitec Communication Systems Limited, 3 Apollo Place, Lane Cove NSW 2066 Tel: (02) 428 9555



INS Product Leaders

TEST INSTRUMENTATION • NETWORK MANAGEMENT SYSTEMS

LAN/WAN ANALYSER

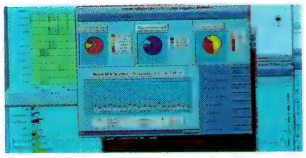
LAN: Token Ring
ETHERNET

WAN: ISDN
FASTPAC
AUSTPAC
TRANSEND
DDN
SNA

PROTOCOLS:

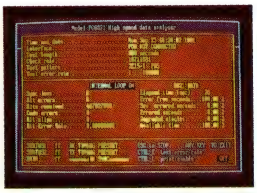
X.25, SNA, HDLC, SDLC, SS7, Q921/Q931, XNS, TCP/IP, NETBIOS, NETBUI, ISO, APPLETALK, MBI, DECNET, SUNNFS, X-WINDOWS, SNMP.

CENTRALISED LAN MANAGEMENT-RMON



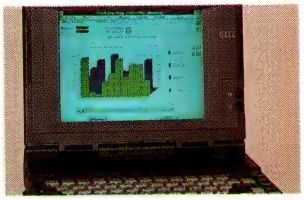
- Full RMON MIB.
- Graphical Interface.
- Total Network Management across entire network.
- Seven - Layer decodes for all major protocols.

PC-BASED BERT



- Turn your PC into high speed BERT.
- Support RS232, V.35, X21, G703, G704.
- G821 analysis with histogram and capture to disk.
- G704 monitor tool.

NOTEBOOK BASED WAN ANALYSER



- Full Duplex to 2MBPS.
- E1 and Fractional E1.
- SNA, X.25, ISDN.
- Frame Relay, SMDS.
- Dual Channel.
- Graphical Interface.

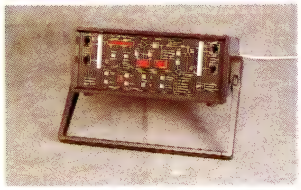
NETWORK PROBE

- Multi-function analyser.
- Built-in interfaces for RS232, X.21, V.35, ISDN.
- Multiple protocols support.
- Light weight/low cost.
- AC/DC operated.

TDR/LAN SCANNER

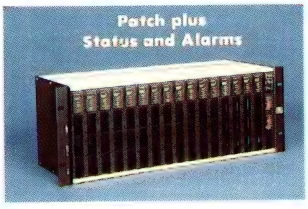
- TDR and cable scanning for UTP, STP, Coax, IBM cabling, up to 100MBPS.
- Measures NEXT, length, ATTENUATION, Resistance, continuity, LAN monitor.
- Optional cable management and cable grading software.

SIMULATORS



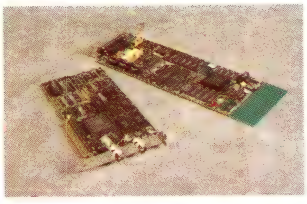
- Most major Telephone network types.
- DDS, ISDN links.
- DDS, ISDN cables.
- Multiple cable gauges, length and speed up to 34.8MBPS.

DATA PATCH/ SWITCH SYSTEMS



- Circuit switching and PATCHING.
- RS232, V.35, X.21, G703 etc.
- Transparent to protocol.
- Full remote or local control.

PC-BASED PROTOCOL ANALYSER

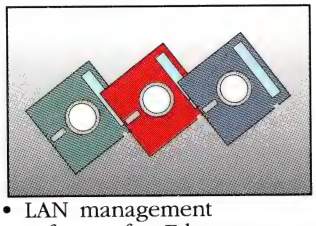


- Turn PC into full function protocol analyser.
- Half size card supporting major protocols, interfaces.
- Speed up to 2MBPS.

LIGHT SOURCE/OTDR/ POWER METER

- Fiberoptic test equipment for LAN, WAN, FDDI.
- PC-based and hand-held.
- Power attenuation, dual wave length test systems, LED or Laser sources, Talk sets.

SOFTWARE



- LAN management software for Ethernet, Token Ring, ARCNET and Appletalk.
- Comprehensive statistics and protocol decodes.
- Low, low, cost!

Please send me more information on:

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- ☐ LAN MANAGEMENT - RMON
- ☐ LAN/WAN ANALYSER
- ☐ PC-BASED BERT
- ☐ SIMULATOR
- ☐ SOFTWARE
- ☐ WAN ANALYSER
- ☐ DATA PATCH/SWITCH SYSTEM
- ☐ PC-BASED PROTOCOL ANALYSER
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ORGANISATION: _____ PHONE: _____

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*Remote Network Monitoring Management Information Base.

A Better Way.

HEWLETT PACKARD

Fax Server Routing from page 28

vendor of standalone faxes to commit to T.30 routing so far, doesn't expect to phase in T.30 support until late 1994 or early 1995. Canon says it is waiting for all T.30 details to be finalised before it tries to implement the standard.

Mailboxes and More

Proponents of the fax server approach say the technology can lead to a wealth of new LAN applications, the most promising of which has been dubbed the fax mailbox. The idea is for every user on an enterprise network to have a personal mailbox for exchanging any type of file. The 1992 version of the T.30 fax protocol accommodates several file transfer methods in addition to conventional fax, such as binary file transfer.

Vision 2000, a consortium of more than 30 Canadian companies with an active interest in fax technology, is promoting a more extensive concept that it calls Future Fax. The group is investigating such options as multimedia fax, video fax, and the use of Group 3 fax to handle X.400 messaging, reports project officer Bill St Arnaud.

The fax mailbox, and facsimile in general, also may not be limited to wire-line communications. The data services task force of the TIA's TR-45 committee is developing a standard for sending fax messages via digital cellular links; this standard may be approved by year's end. The arrival of such a standard would pave the way for a new generation of fax-capable notebook computers and personal digital assistants along the lines of Apple's Newton.

James Rafferty

Fax Server Routing, B.S. (Before Standards)

Up to now, vendors of fax server products have used several different methods for routing inbound documents to networked users. The main ones are operator-assisted routing, optical character recognition, dual tone multifrequency (DTMF) dialling, and direct inward dialling. All of them are proprietary solutions, and all have some glaring weaknesses.

With operator-assisted routing, a network operator logs into the fax server to get a list of documents received. The operator then must call up each document on screen to determine the intended recipient. To route the documents, the operator must view each one and decide who the recipient is, based upon information contained on the fax cover sheet.

The obvious limitation of this approach is that an operator is needed to route all documents. Some products, such as Faxmaster from Caere Corporation, ease the task somewhat by letting operators view several documents at once and then make simple menu choices of whether to print the document, route it as a fax, or route it as an attachment to an e-mail message.

With routing schemes based on optical character recognition (OCR), senders must enter a typed routing code in a special zone on the cover sheet or between a special set of characters on the sheet, such as a set of double brackets. The routing code must be typed so that it can be interpreted by the OCR software used by the receiving fax server. If the routing code is legible to the OCR software and can be identified, the document can be routed to the right user.

This approach requires special care by the sender and frequently will not work if the wrong typeface is used or if the document is sent in the standard resolution for fax transmissions (203 by 98 picture elements [pixels] per inch).

Under the DTMF, or touch-tone, routing method, the sender of a fax document must wait at the sending machine until a call is established with the fax server. At that point, the sender must use the fax machine's keypad to enter the digits of a fax extension number for the intended recipient. This method is workable if supported by the sending fax machine and the phone network, but there are many situations in which it is difficult or impossible to enter additional digits after automatic dialling.

Direct inward dialling (DID) has been the most foolproof method for routing faxes through a server, but it is also the most costly. When DID is used with a LAN fax server, each user on the LAN is assigned a seven-digit phone number for receiving fax messages. Senders can then dial the fax number of intended recipients, and the DID hardware and related software at the server automatically route the fax message to the correct node on the network.

Some special requirements for direct inward dialling routing include additional hardware on the LAN fax server to manage the DID operation. Companies using DID routing also must have special inbound DID lines installed.

A fifth routing method has been developed by All the Fax Incorporated, a fax server vendor. The method, called Universal Autoroute, involves putting the routing code in a T.30 frame normally reserved for the sender's ID. The method works, but it has not been widely adopted by server vendors.

James Rafferty

LAN Testers from page 32

formation is more readily available in Token Ring packets. For instance, Token Ring LAN packets match specific types of errors to MAC addresses. But Fluke is about to release an Ethernet version, as well as a unit that handles both Ethernet and Token Ring. The new analysers will be the same size as the 670, Mullins says.

The Framescope 802 from Scope Communications handles Ethernet and Token Ring. Like the 670, it identifies specific packet errors and reports frequency per station and lists the MAC address of the nodes that are issuing the faulty packets. Unlike the 670, the Framescope simulates network traffic. (Fluke says it plans to add simulation at some point in the future). And the Framescope comes closer than the Fluke unit to mimicking the functions of a protocol analyser by tracking specific types of protocols, including NetWare, IP, DECnet, and AppleTalk, and reporting which stations are using which.

Unlike the 670, however, the Framescope cannot measure the length of wiring runs, check out hubs and concentrators, or determine impedance. Scope offers a separate unit, the Wirescope 16, for cable testing, and the company says it plans to keep the two types of testers separate. The vendor believes that doing so will let it keep the size and weight of each unit down without sacrificing features and functions.

Fluke doesn't plan on expending a lot of energy trying to shrink its product (which measures around 30cm high by 17cm wide by 6cm deep), since it says doing so would mean sacrificing features like the display, which needs to be large enough to accommodate network statistics and error information. "Sure it might be nice to have the 670 a bit smaller,' says Mullins. "But our feeling is that when people use the 670, they're going to find their problem in a minute or two. They won't have to carry it around for long."

Mullins says that Fluke originally investigated the possibility of putting the 670 technology into a notebook PC. But customers didn't like the idea. They wanted a device they could carry into a crowded wiring closet.

The future of handheld network analysers is still uncertain. Some vendors, like Microtest, say they plan to combine the features of cable and network testers into new kinds of devices. At press time, Microtest was preparing to unveil a handheld tool that combines cable diagnostics, protocol analysis, and other critical functions. "Microtest believes that by combining the functionality of multiple products in a single solution, we will create a new category of handheld tools," says Mark Phillips, Microtest's Marketing Director.

Mary Jander

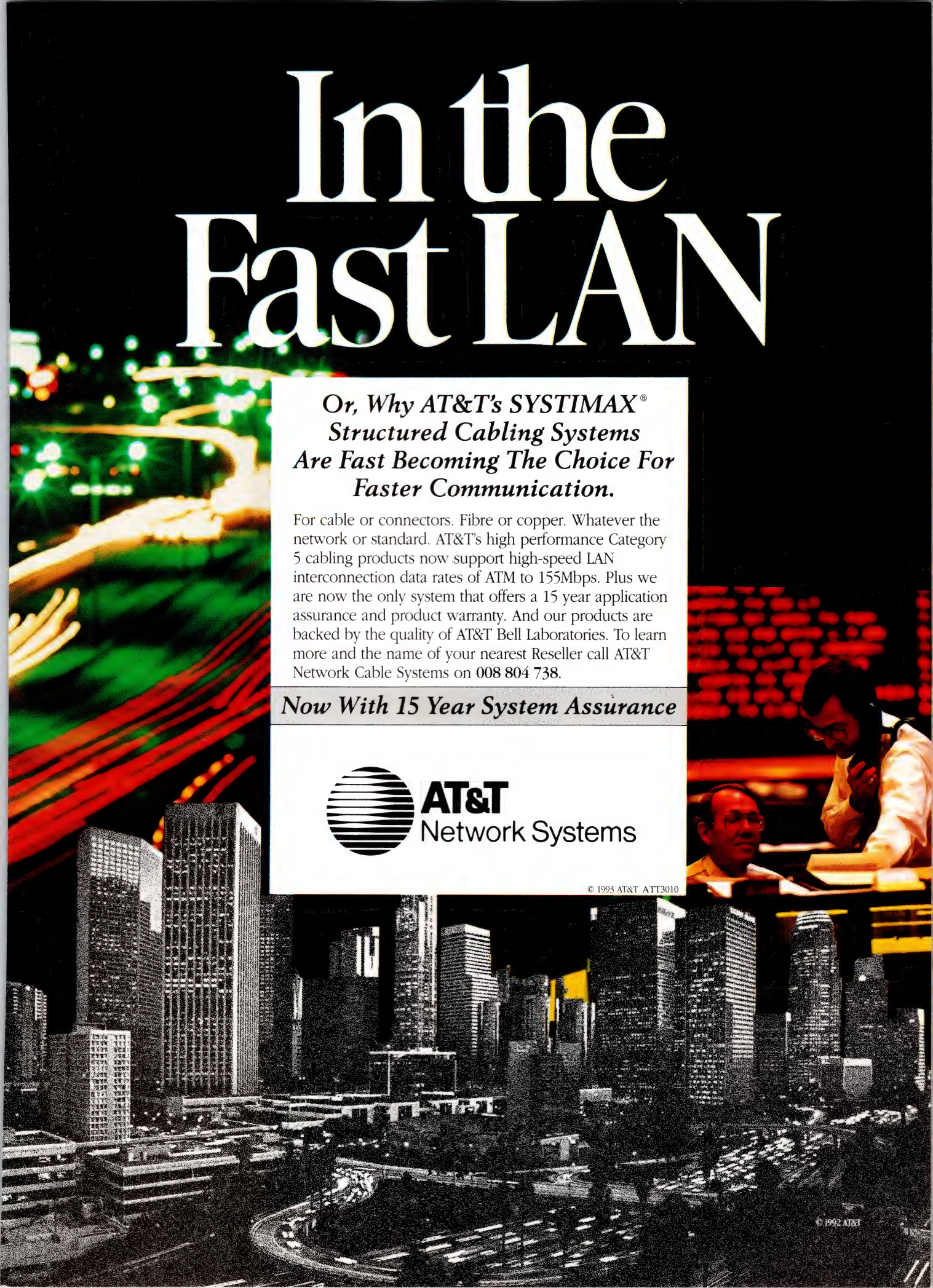
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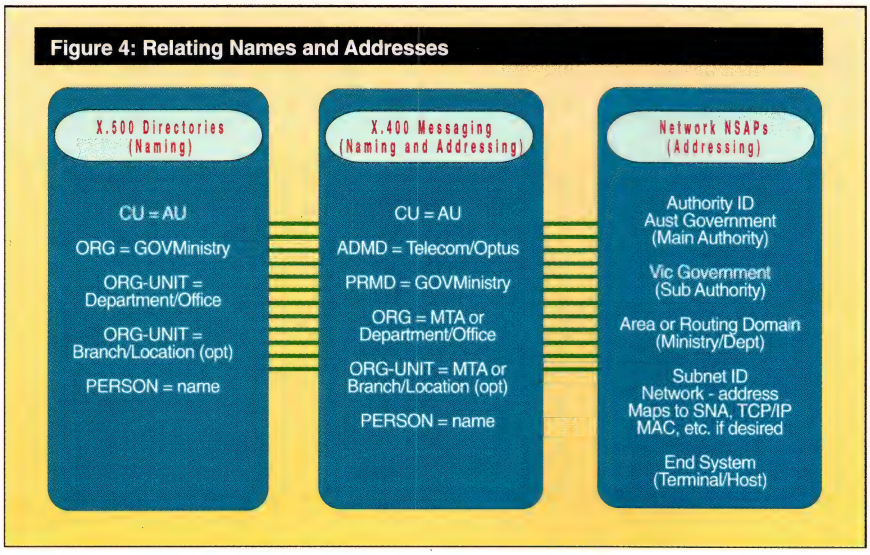
Figure 4: Relating Names and Addresses



minimal. However, a range of products connected together running a business is another story. The complexity of IT systems has increased a thousand fold, business dependency has increased a thousand fold and the inter-relationships between the business and the IT system are a blur. Without the basic IT policies in place, there is no basis for good engineering practices to scale the system, limited ability to maintain the system, limited ability to diagnose the system, limited ability to cost the system and limited ability to understand the criticality of it with respect to the business.

A Named Progression

The way in which naming and addressing should be progressed could be as shown in Figure 4. It shows how X.500 directory system naming, X.400 messaging naming and addressing and network addressing can be organised and mapped. Notice that for network addresses (NSAPs — Network Service Access Points) the network independent scheme is used and the de facto and proprietary technologies are mapped to the OSI/CCITT technologies (international NSAP formats). This can only happen once the OSI/CCITT formats have been defined for the organisation. One cannot take proprietary or de facto addressing schemes and map OSI addressing to them because they do not relate or fit into a global addressing plan.

Network dependent NSAP formats are available for X.25, ISDN/PSTN and the telex network. However, these demonstrate the primary use of a fixed network as opposed to using independent schemes which can map over a range of fixed network technologies. Figure 4 shows a hypothetical government allocation as described by the GOSIP documents.

Note the differences between X.500 names and X.400 addresses, even though similar keywords — ORGanisation and ORGanisation UNIT — are used in both schemes. The keywords can be a cross between X.400 and X.500 but it will depend on the structure of the organisation and how these technologies are deployed within it. The NSAP format identifies, at the top level, registration and allocation authorities similar to those of X.500 and X.400 with CU, ORG and ADMD/PRMD. The de facto and proprietary network addresses can be mapped into the low order bytes of the NSAP. This is done for two reasons — so that addresses are included and systematically administered within the same naming and addressing policy of the organisation and so that addresses can be mapped or translated by network gateways that convert (for example) IP addresses to CLNP addresses or TCP addresses (ports) to OSI transport TSAPs.

The relationship between a business and its IT system is complex and cannot be covered in a single *Tutorial*. The bottom line is that IT is there to serve the business. The major issues now facing business, apart from the integration and migration of IT, are optimising operational costs, dealing with market shifts, greater competition and internationalisation, improving information management and quality practices and introducing organisational development. In a world overflowing with technology, why not use IT to assist in resolving these? And don't forget the naming and addressing!

Alan Lloyd

100VG-AnyLAN from page 44

Importantly, because the hub is arbitrating individual requests to transmit packets, it can also arbitrate different priority requests, acknowledging higher-priority packets first. In this way, HP says, 100VG-AnyLAN can offer guaranteed bandwidth and latency as low as 121 microseconds — compared to the 30 milliseconds attributed to 100Mbps CSMA/CD proposals.

"If I have a string of video or voice information I care that that bandwidth is regularly available to me over and over again, and that there's not too much delay," says Clark. "We can support hundreds of multimedia channels within a VG environment and still get plenty of data traffic, because one of the beauties of this system is that when it's not transmitting video all the data goes through at 100Mbps."

For their part, 100Mbps CSMA/CD backers say that delays can easily be handled by memory buffers and that by moving arbitration to the hub, HP's approach simply means that hubs will become more expensive. HP counters that for the same reason, network adaptors will eventually become less expensive. Brice Clark is predicting that prices for 100VG-AnyLAN will reach $US200 per port by 1995.

Both the 802.30 and 802.12 IEEE committees are rushing to release draft standards by the middle of next year, but, like 10Base-T's early days, the lack of a standard is not holding vendors back. HP is planning to release products early next year and Grand Junction (founded by Ethernet inventor and 3Com founder, Bob Metcalfe) is already shipping products now.

The High-Speed Trinity

While pushing 100VG-AnyLAN hard, Hewlett-Packard says it has not lost sight of the importance of other high-speed technologies now emerging — particularly ATM, which is being pursued aggressively by SynOptics and others, and Fibre Channel (see 'Can Fibre Channel Challenge ATM?' *Australian Communications*, July 1993).

Outlining his company's plans at a recent seminar staged by HP's Test and Measurement Organisation, Clark maintained that "The reality is that all of these technologies in one degree or another are probably going to be utilised to solve high-speed networking problems in the LAN environment and in the WAN environment." He says that 100VG-AnyLAN will actually be a driver for central ATM switches because it will put inexpensive bandwidth on the desktop. Although he concedes that "ATM standards are making excellent progress," he claims it will be some time before ATM to the desktop is cost effective: "If your PC only costs $1,000, you don't want to spend that much connecting it to the LAN."

He says HP is focusing on all three technologies — 100VG-AnyLAN for high-speed to the desktop; Fibre Channel to create specialised workgroup clusters; and ATM for WAN and LAN backbones. The company will begin to introduce products in all three categories next year.

Mark Smeaton

business network 'fixed' or are communications services such as MANs and ISDN used dynamically on demand for file and message transfer. What are the technology and operational costs of doing things one way or the other? Have cost models been used?

The approach to IT at this level is complex (and rarely used) but if the business is optimising operational costs, making the IT infrastructure support the business efficiently is crucial. This optimisation and re-engineering process can be difficult on a tactically grown IT system, particularly in the cases where the IT system's value and its information flow characteristics are not well documented.

When relating the IT system to the operations and procedures of the business, the impact of distributed system technologies on the business should be considered. The relationships are shown in Figure 2.

Directory systems contain organisational information, information identified by a name that is related to the organisation. Thus directory systems must have naming, information content and distribution policies and will require administration.

Messaging systems are used by staff and message-based applications. Messaging systems must therefore be configured with names and addresses consistent with the organisation's structure.

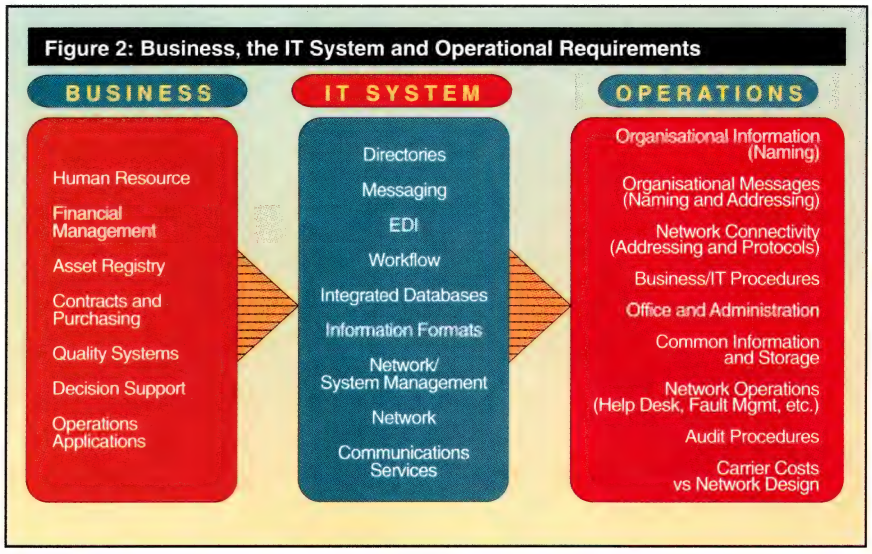
The IT system in total is supported by networks and communications technologies and services, which use protocols.

Protocols have source and destination addresses. These addresses have formats which are defined by the proprietary, de facto or OSI technologies used and allocated according to assignment authorities or a numbering plan. The information technology system design should have an address policy, setting out who administers them and how they map between the various networking technologies.

Information consistency will affect information administration (and references), distribution (and thus network loading), the higher level decision support tools and business effectiveness. Information consistency should also be the subject of business policy, particularly where there are workflow or embedded quality system procedures.

IT systems will always have an impact IT administration, office and audit procedures and the network operations and management. Finally, managers should note that the information technology systems will affect the network design approach, the choice of communications services and the cost structures for such services.

Note that naming and addressing is an issue in most of the above considerations. More importantly, note how this issue relates to the complete business IT infrastructure and enterprise. Naturally management in a large scale system is key.



Realising the Design

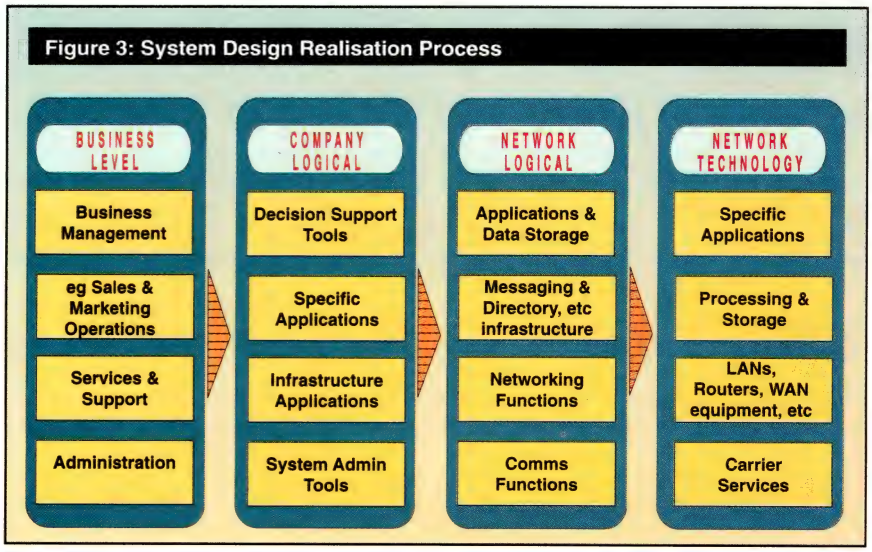
To transform a business level schema into a system using actual technologies and products needs a slightly different set of parameters for addressing. The process is based on the Business/IT Systems/Operations flow, but must also must include business functional components (e.g. sales/marketing), their location, IT applications, IT infrastructure components and products themselves.

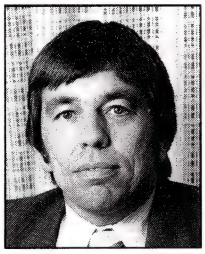
For example, the marketing department might need a forecasting package, used across the whole of the marketing operations and therefore distributed. It uses workflow desktop technologies with local and central database servers. The application is very specific to marketing (Company Logical) and is supported by infrastructure applications such as workflow systems and networked databases. Because the application is distributed and uses workflow, it requires messaging, data storage, network support and communications (Network Logical). The network logical requirements are then used for the system design that will incorporate carrier services, LANs, WANs, servers with specific service applications and processing/storage devices (Network Technologies).

Although this is a simplistic example, reiterating the process for each business requirement should determine the common parts of the system that can be treated as infrastructure, the operational management requirements of the system, the cost structures of the system and, most importantly, the dependency levels (i.e. risks and security threats). Figure 3 shows the method. The systems management requirements could also follow this design approach.

The basic policies that are fundamental for all distributed systems are naming and addressing, systems administration and systems management. There seems to be a trend, because network products are cheap and reliable, that a limited skill base is needed to support them. This trend may be related to the network design approach of just connecting a list of protocols.

It is true that the level of support required for a product, on its own, may be





The Complex Business-IT Relationship

Alan Lloyd

The *OSI Tutorials* to date have described the major OSI application standards, how large scale system design should be approached technically and operationally, and how specific technologies should be related to the business enterprise. This month's *Tutorial* takes the relationship between IT and the business a step further, providing frameworks for relating the business to IT systems.

The formulation of an IT strategy depends on how an organisation views the role of IT in supporting the business. A simplistic approach is to use technology components, such as Unix, SQL databases, servers, TCP/IP, PCs with Windows accessing the mainframe — all managed from a workstation with SNMP. A more considered approach is to examine the evolution of the business and design an IT system to suit that process.

An IT system may comprise many types of technology services, such as EDI, directory systems and messaging. These will serve the business requirements in different ways and affect a business' operational and organisational characteristics, as well as its cost structures.

Figure 1 below provides an overview of the way information technology serves and affects business operations. The actual system design and implementation determines some business cost structures, the efficiency of the system and may affect Organisational Development (OD).

A framework for relating cost models to system modelling and system management using the five levels of business, services, network operations, network and network elements has been provided in previous *Tutorials*.

Looked at from this perspective, the overall productivity and bottom line of the business is affected not only by the logistics of the organisation, staff capability and work practices but also by the support and services provided by the total IT system.

Organisational Development programs are used to improve business competitiveness. The OD concept embraces how an organisation evolves, improves its skill base, its products and its services. Aspects of OD include Total Quality Management, workplace reform, leadership training and teaming, learning enterprises, using techniques such as scenario planning, and the promotion of personnel development.

The reason for including OD within the IT system is that an organisation seeking to improve itself by making changes to its culture, thinking values, processes and people interfaces, tends to revert back to its old methods of working because of business 'anchors.' Anchors can be a product portfolio, a business culture or possibly the IT system. An IT system or system strategy that does not support process and organisational change is obsolete on the drawing board. An IT system which does not include high level decision support tools will make the continual process of evolving business strategy and OD very difficult.

For example, consider the introduction of a quality system. One approach to quality is to architect and define the process flows and then document the system procedures, work procedures and associated auditing methods. The danger with this approach is that it may lock processes and skills into the organisation. People focus on managing the processes (and its documentation), rather than business efficiency. A solution may be to include the quality system as part of the IT system. Where possible, automate using workflow, electronic data interchange and messaging infrastructures.

This is one of a series of open systems tutorials by Alan Lloyd, Strategic Developments Manager for Datacraft Australia. Alan represents Australia on numerous international standards bodies and is the co-author with Gary Dickson of *Open Systems Interconnection* (Prentice Hall, 1992).

Business and Operations

The relationships between the business, its IT system and how the IT system relates to operational requirements and processes is shown in Figure 2. At the highest level, the business needs the usual IT support of personnel, finance and decision support, as well as operational applications. These business requirements are supported by IT system components such as EDI, workflow and databases. The relationship between the two is really a question of the system design philosophy.

Does the IT system provide a messaging infrastructure for EDI and workflow? Does it have integrated databases? Are common information formats mandated? What are the policies for network and system management? Do the directory systems support the telephone, messaging and network management systems? Are the communications services used based on a single type of technology (e.g. X.25 or DDN)? Is the

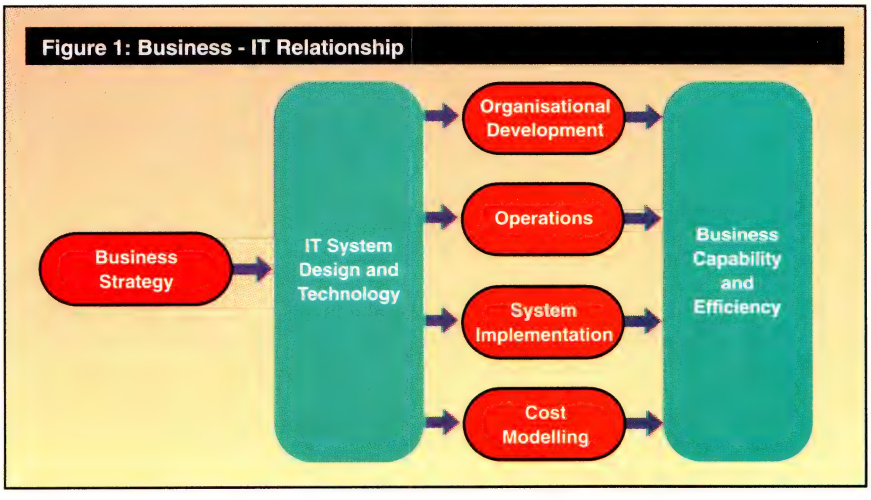


Figure 1: Business - IT Relationship

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High-Speed Networking

HP Gains IBM Support For 100VG-AnyLAN

With the religious debate about the relative merits of Ethernet and Token Ring apparently now settled in favour of the former, the latest networking Holy War — how to deliver 100Mbps bandwidth to the desktop over UTP cabling while the world waits for ATM — may be over before it really got started. While battle lines inside and outside the IEEE have been drawn for several months now between HP/AT&T's 100VG-AnyLAN (formerly 100Base-VG) and the CSMA/CD solutions favoured by Grand Junction, 3Com, Intel, SynOptics and a few others, the balance of forces has now shifted significantly following IBM's decision to support the HP/AT&T proposal.

Coinciding with the renaming of 100-Base-VG to 100VG-AnyLAN, Hewlett-Packard and IBM announced last month that they will work to include Token Ring support in the standard now being developed by the IEEE's 802.12 committee. Both say that the new standard will provide existing Ethernet and Token Ring users with a logical upgrade path to high-speed networking. Meanwhile, the IEEE has sanctioned the CSMA/CD group's approach under the banner of a new 802.30 committee.

Invented by Hewlett-Packard with additional development work by AT&T, development work on 100VG-AnyLAN started three years ago, according to Brice Clark, Strategic Planning Manager at HP's Networks Division. The goal was to meet demand for more desktop bandwidth without forcing users to scrap existing cabling and equipment in the way that high-speed alternatives like FDDI dictate. According to Clark: "We need a technology which is like 10Base-T but which offers true benefit to the customer without price penalty."

HP's approach to meeting this goal with 100VG-AnyLAN has several elements: it makes use of the four pairs of wires found in most UTP cabling (10Base-T uses only two pairs); it retains support for Ethernet frames (in fact 100VG-AnyLAN was designed to be 'frame independent' — hence the ability to now add support for Token Ring, although there are no moves as yet to also encompass FDDI); it eliminates packet collisions; and it provides low-latency performance.

As well as supposedly protecting users' investment in most network hardware like bridges and routers by supporting Ethernet (and now Token Ring) frames, HP points to the ability to use existing cabling as a major advantage. 100VG-AnyLAN replaces 10-Base-T's Manchester encoding scheme with 5B/6B NRZ encoding to put 'quartet' signals on each of the four cabling pairs found in Category 3, 4 and 5 UTP. For STP, it puts two quartets on a pair and for fibre optic cabling it places all four quartets on one fibre.

In the US, HP's own surveys suggest that around 70% of the total UTP installed base conforms or is at least close to Category 3 cabling standard. Why replace all of that cabling with Category 5 (as some 100Mbps CSMA/CD and FDDI-over-copper proposals mandate) or fibre for 100-Mbps to the desktop if you don't have to?

With 100VG-AnyLAN Clark contends that "The result is if you have a 10Base-T network running on four pair cabling today, you don't have to touch it, you can drop in a new adaptor card and a new hub and turn on 100Mbps. You don't even have to ask the question 'what's behind the wall?' If 10Base-T is working, this will work because the transmission characteristics are virtually identical."

And he uses Hewlett-Packard's own Category 3 cabling infrastructure to illustrate the cost benefit: "It would cost us $US30 million as a company to go from Category 3 to Category 5. To give you a feel for what that means, that's enough money saved in the wiring to put 100VG-AnyLAN to half the desktops in the corporation — and that's at list price. That's a pretty compelling set of economics."

Avoiding Collisions

But it's the elimination of collisions by using a Demand Priority Protocol access method which has many Ethernet traditionalists up in arms — and Hewlett-Packard claiming a key competitive advantage. By removing the CSMA/CD (Carrier Sense Multiple Access/Collision Detection) access method implemented in 10Mbps Ethernet, HP claims to have eliminated the overheads of packet collisions and recovery and thus substantially increased throughput and reduced latency — key factors for the successful introduction of time-sensitive multimedia applications.

100VG-AnyLAN "uses regular Ethernet frames, which is what defines compatibility," says Clark. "Our opposition keeps saying 'Oh no, it's not CSMA/CD' — we keep saying 'the customer doesn't know anything about CSMA/CD'."

According to HP, Demand Priority uses the star topology of 10Base-T and most Token Ring LANs to advantage by implementing enough intelligence in the network hub to arbitrate requests to transmit packets. Under the protocol, a node requests permission from the hub to transmit a packet over the network. If the network is idle, the hub acknowledges the request and the node begins transmitting its packet to the hub. The hub decodes the arriving packet's address and directs the packet to its destination port. HP claim this is inherently more secure than broadcast Ethernet or Token Ring techniques since data packets are directed only to their intended destination port.

Continued on page 48

The Options According to HP

	10BASE-T	100VG-ANYLAN	CSMA/CD
NETWORK DESIGN			
Network Diameter	2,500m	4,000m	220 to 370m
Cascading	Yes; 3 levels	Yes; 3 levels	2 levels, one closet
Collapsed Backbone	Yes	Yes	Limited topologies
CABLE SUPPORT			
UTP Category 3	100m	100m (with 25 pair)	100m (no 25 pair)
UTP Category 5	100m	200m	100m
STP Type 1	100m	200m	No proposal
Fibre Optic	1,000m	2,000m	No proposal
PERFORMANCE			
Throughput at 100m	95% of 10Mbps	96% of 100Mbps	80% of 100Mbps
Throughput at 2,500m	80% of 10Mbps	80% of 100Mbps	No support
802.3 'FEEL'			
IEEE 802.3 Frame	Yes	Yes	Yes (goal)
Media Access	CSMA/CD	Demand Priority	CSMA/CD
SNMP Mgmt and MIB	Yes	Yes	Yes
APPLICATIONS SUPPORT			
Time Sensitive Apllications	No	Yes	No
Future Higher Data Rate	N/A	200-400Mbps	Never

Source: Hewlett-Packard

the American 49-disturber model for near-end crosstalk," says Nicholls. "This has also been done locally with Telecom's model. Over different cable pairs, the BER has been at 10^{-7} which is the target, and that was in the presence of a disturber, and trialled over the distances we require — up to 5km."

The low error rate is necessary when you compress images in the region of 100:1. One bit lost results in 100 bits of error when the image is untangled, so forward error correction (FEC) is an essential part of these systems. CAP and DMT both use the Reed-Solomon two-dimensional matrix form, which is pretty safe if you only get short burst errors. This is the type and level of FEC used in CD-audio, but you need two layers of interleaved R-S correction to get the level of error-restoration achieved in CD-ROMs. However, by using these techniques, it's possible to gain advantage from the low-cost consumer-product production runs of the chips and still get low bit error rates.

Too Late Anyway?

AT&T is proceeding with CAP and has the standard already on silicon. However, DMT is obviously favoured for data-rates higher than 1.5Mbps, and Motorola says that it will have an LSI implementation in 1995 and a two-chip VLSI implementation in the early part of 1996.

"It depends on the timescale Telecom wants, and the technology they select," says Riedl, who is quite happy to quote on DMT or CAP modulated equipment. "CAP is also in development, but at least it is in silicon. So to implement it is just a matter of engineering, while DMT is at a much earlier stage — still in the research stage — and DMT is inherently more complex."

And that's Telecom's problem — and why the telcos around the world are in such a hurry for ADSL, but don't know what to do. You can see ADSL as an 'interim' technology on the way to the fibre-future, or you can see it as a desperate attempt to grab video distribution away from the terrestrial and satellite broadcasters, using a half-baked technology that will need heavy cross-subsidisation from telephone users.

The telcos all recognise that in the next few years we'll see:

- Digital-video-over-satellite come of age;
- Wide-screen extended definition (750 line) digital TV standards from the US and Europe;
- Possibly now a joint world standard of 16:9 EDTV with multiple layers (videophones to EDTV) suitable for satellite, cable and terrestrial transmission;
- A four-fold capacity boost in UHF, VHF and MDS terrestrial channels through the use of digital compression; and
- The appearance of the Super High Frequency (SHF, 3 to 30GHz) band with cellular wireless-cable networks offering 200-odd EDTV channels and some interactive feeds.

And none of this augers well for glass fibre or ADSL. The new SHF band alone, has nine times the information capacity of all of the radio spectrum in use to date, and there's a lot of UHF spectrum becoming available. So there's going to be a highly contested market for TV delivery. The video carriage business is now one of abundance, not scarcity, so cost is going to be the main consideration — all other things being equal.

It's hard to see that any ADSL system, in the next two or three years, could cost less than, say $1,500 per connected household, and more likely will be $2-3,000 — which effectively, will double the capital investment in the national telephone network, on a per-household basis. And we can only assume that Telecom plans to cross-subsidise ADSL costs from phone rentals — because the $40/month subscription to any new Pay TV service would necessarily come on top of these carriage charges.

Stewart Fist

ADSL pairs would be as hospitable an environment as the inside of a microwave oven and — maybe that's the point — perhaps the 1MHz R/F emissions keep all the paper insulation dry?

If you thought that telephone quad was only capable of 4kHz or about 14.4Kbps, then remember that recently they've managed to get ISDN data along them for 5km at 160Kbps using 2B1Q line coding. But that still leaves a big jump to the ADSL multi-megabit rates! Still, one can't doubt that they are actually doing it now.

The ANSI specification for DMT proposes 1.5, 2 or 6Mbps video data-rates, and it uses both amplitude and phase modulation. The first 4kHz of bandwidth is reserved for analogue telephones, and back channels are provided for a signalling channel (various, from 16Kbps to 384Kbps).

From what I can see, the DMT technology is still in the early lab stages, but Rob Nicholls of AWA says that it has been trialled in suburban streets at rates up to 2Mbps over distances of 4.5km.

He says that it is also extraordinarily resistant to crosstalk: "because of the orthogonality of the pairs, the only effect is far-end crosstalk. And because it is asymmetric, it doesn't suffer — or only very mildly. It does, however, suffer from interference from other services — like the 2B1Q coding of ISDN, or a T1 service down the same ducting — that's where things will deteriorate."

Nicholls says that CAP is available in silicon at 1.5Mbps now, and that DMT will take about six months — but that DMT probably has the potential to get to 6Mbps (over 2.5km) while CAP possibly doesn't.

Riedl says "CAP will go close to 6Mbps over 2.5km." He admits that there is a performance difference between DMT and CAP, but that it appears only in certain circumstances, and it depends on what you are trying to do, and on the noise environment. "DMT will always be a little better than CAP in the average situation," he says, "but it is more expensive and complex to implement." So the questions are: Do you need that [minor improvement] or not? — and: Why do you need 6Mbps anyway? You certainly don't need it with MPEG2 video compression.

Riedl holds that 2Mbps in Australian conditions, over Australian wires, is enough for an interim system. "That isn't necessarily true for NTSC, but it is for PAL," he says. "If you take as your criteria Better-than-VCR-quality and Near-CD-quality-sound, then CAP is adequate."

Both CAP and DMT need the twisted-pair to be carrying very high frequencies. The DMT specification is to be finalised, but it calls for analogue signals to be carried over the pair in the normal band from 0 to 4kHz. A bi-directional digital channel will then occupy space between 20 and about 40kHz (depending on the back-channel's bandwidth; from 9.6 to 384Kbps) and the main video feed will exist above this.

Typically, from 20kHz up, the frequency is divided into carriers — called 'beans' — (or is someone pulling my leg!) spaced at 4kHz intervals, and the video channel will extend from about 50kHz to just over 1MHz (occupying 256 beans). Any ISDN services will be transcoded from the 2B1Q line code system to ADSL/DMT if it is to be carried over these systems.

Each 'bean' carrier is automatically analysed for noise — limited by a permissible S/N ratio of no more than 3dB — and a 10-level (max) QAM signal is then modulated onto this carrier. Current implementations use a large number of 56,000 DSPs for this analysis.

The secret apparently, is in the use of orthogonality in the carriers (as I understand it, each carrier being 90 degrees out of phase with the next.) "Both CAP and DMT techniques have been trialled (in labs) over a number of different line-types [and] with different models of crosstalk, mainly using

16 bits. How fast is that?

'Speed' is an over used word these days. Particularly when it comes to modems. While some manufacturers claim speeds of up to 57,600 bps, it's really throughput they're talking about. And, even then, most can't deliver. The fact is that many of these cheaper modems have an 8 bit processor. And though they claim top of the range features like data and fax transmission at 14,400 bps and V.42bis, they simply run out of grunt. At about 35,000 bps. (Compared to 16 bits, it's a little like a family car racing a formula one.)

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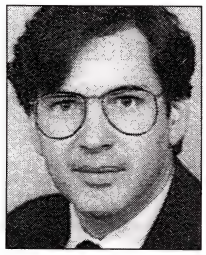
INTERNETWORKING

ATM LANs: Software Will Make the Difference



Nick Lippis

Most discussions about ATM LANs begin and end with hardware. That seems logical — after all, ATM is a switching technology, and it's pretty tough to talk about switching without getting into hardware. But anyone who bases an evaluation of ATM on hardware alone is making a mistake.

The fact is that software, not hardware, will determine whether ATM LAN technology succeeds or fails. Software will dictate the overall behaviour of ATM networks, governing such features as alternate routing, load balancing, and the like. Software also will determine whether equipment from different vendors interoperates, whether applications can make direct use of ATM transports, and whether industry-standard network management platforms can handle ATM LANs.

Software for ATM switches and hubs falls into four categories. Modules for connection management, or signalling, control network behavior. Modules that implement an ATM application program interface give applications access to ATM services. The final two categories are network management agents and network management applications.

Connection management software provides what's needed (primarily a signalling protocol) to set up, tear down, and keep track of permanent virtual circuits (PVCs) and switched virtual circuits (SVCs) in ATM networks. Connection management modules also offer hooks into accounting systems for chargebacks, re-route traffic around failed nodes and links, and allocate network bandwidth.

Industry standards for connection management are sure to have a big impact on software improvements, but those standards won't be developed overnight. Because most ATM LANs today comprise only one ATM switch with five or fewer ATM interfaces attached to it, development of a standard network-to-network interface (NNI) is a low priority within standards organisations. Until NNI standardisation occurs, certain connection management features are sure to remain proprietary, including features for channel routing and virtual path selection between multiple ATM switches, failure recovery and automatic reconfiguration, load balancing, and name services that support dynamic address assignment and internetwork address resolution.

A more likely short-term target for standardisation is an ATM user-to-network interface (UNI). The arrival of a standard UNI will pave the way for standards that govern certain connection management features pertaining to individual nodes. For example, with a UNI in place, developers will be able to hammer out a standard way for switches to handle bandwidth on demand for end-users or to reconfigure users onto different logical (or virtual) workgroups.

An ATM API provides a standard set of programming 'verbs' that let programmers write applications that access the ATM layer directly. This kind of API will be most useful for distributed multimedia applications which require real-time delivery of data. At this point, ATM API software is virtually non-existent.

Management agents, the third type of ATM software, reside within desktop devices and ATM switches. Management agents can be viewed and polled by an SNMP-based management system.

ATM management agents collect management data from ATM switches and adaptors. Data handled by agent management information bases (MIBs) includes switch configuration, port and virtual path status, cells received and transmitted, and error rates. Most management agents can be accessed via an SNMP management platform to establish PVCs and SVCs using SNMP 'set' commands.

ATM network management applications take data collected by management agents and turn it into information that helps users manage their ATM networks. These applications typically provide a graphical representation of the network topology and create a real-time inventory of the type and status of all devices plugged into the ATM LAN. Most ATM vendors now offer management applications that tie into the leading integrated net management packages, such as IBM's NetView/6000, Hewlett-Packard's Openview, and Sunconnect's Sunnet Manager. All ATM vendors have said they will support the Open Software Foundation's Distributed Management Environment (DME) when that standard becomes available.

A number of software-related issues still have to be resolved for ATM technology to realise its awesome potential. The most important of these concern interoperability, congestion management, and the ability of ATM LANs to handle broadcast and multicast traffic.

Connection management software is the most important determinant for interoperability. It also is the most proprietary aspect of ATM software today. Without connection management standards, managers who implement ATM LAN products will have to cast their lots with a single vendor — something most have learned to avoid through bitter experience. Standards will come along slowly and will most likely start with the UNI. Prospective ATM users need to keep a close watch on the standards development process.

For congestion management and flow control, two strategies have emerged, neither of which is especially ideal. One approach involves sacrificing bandwidth to avoid congestion: traffic levels are deliberately kept below the maximum to make sure congestion doesn't occur. Under the second approach, traffic is buffered at several intermediate points throughout the network. This takes care of possible congestion, but results in longer network delays.

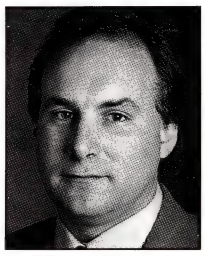
LANs and network operating systems live and die by their ability to handle broadcast and multicast traffic. ATM vendors have yet to come up with any standards for handling such traffic. Until ATM software catches up, the rules for deploying ATM LANs are going to be restrictive. That doesn't mean that network managers should stay away from early ATM LAN products, but it does mean some careful planning is in order.

A good place to start is to pilot an ATM LAN and compare what vendors provide in the way of software. Don't be oversold on ATM just because of hardware. Second, early ATM LAN users should reconcile themselves to using a single vendor for interface cards and switches. Until standards are developed fully, interoperability cannot be guaranteed. Finally, it could be worth investigating whether technologies like switched Ethernet and micro-segmentation can deliver the bandwidth needed in the local area, until some of the issues outlined above are resolved.

ATM vendors have a lot of ground to cover in developing effective software for their switches and hubs. At this point, however, the shortcomings that exist are a normal part of the development process. As software problems are ironed out, ATM's ability to switch traffic at gigabit speeds will begin to shine through.

Nick Lippis is President of Strategic Networks Consulting Inc. (Rockland, Massachusetts), and specialises in enterprise networks.

LAN VIEWS



Graeme Le Roux

Sharing Removable Media

Every so often someone asks me to design a LAN in which a CD-ROM or some other form of removable media is attached to a server so that it is available to users. In most cases this is perfectly reasonable; however, there are some practical issues to be considered before simply attaching removable media to your favourite server. First of all, consider just how you intend your users to access the drive. Obviously users will access data stored on media mounted in the unit across the network, and the impact of that access will have to be assessed and provisions for it made. However, there is a more basic consideration — who is going to mount the media? As a general rule a LAN designed around a server to which any user has physical access is both insecure and unreliable.

Even with the best of intentions people make mistakes. A good administrator avoids mistakes through training and experience. Users, almost by definition, do not have this training and experience. Even when good administrators are in a hurry, feeling out of sorts, frustrated, etc. they follow a routine almost by reflex; check that users do not have a live connection to a CD which they intend to change, pause or shut down any process which might access the CD, close and bar access to any index files that may reside on the server's hard disk, wait for the drive to spin down and only then change the CD. Occasionally they slip up and the results are less than pretty. I've seen days of work lost on NetWare, Unix and LAN Manager-based systems because software, and in some cases operating systems, have been crashed by people inadvertently dismounting volumes which are in use. At the very least a number of users will be inconvenienced. On the other hand users who need access to a variety of, for example, CDs will be loathe to accept a system in which they have to constantly ask administrators to change discs for them. Administrators are likely to have other things to do anyway.

Assuming that you do decide to attach some form of shareable, removable media to your server, then there are performance issues to consider. Putting a CD-ROM onto your server for random access, as opposed to simply using it as a big floppy for software installation, is precisely the same as attaching a very slow hard disk. If you don't already have a suitable controller in your server you will have to install one. If you have a suitable controller you may have to consider upgrading it.

Concurrent accesses to a fast and slow device on a single SCSI bus can often adversely impact the system's gross data transfer rate. This in turn can require more memory and possibly warrant a processor upgrade to maintain overall system response time. In fact if you intend to use removable media — other than CDs — as a shareable device which will be continually mounted, then in most cases you will be better off adding a low cost hard disk to your server and relying on the tape unit you already have as a method of transporting a large amount of data. After all is said and done, the traditional EDP industry has found this to be a practical and cost-effective method of operation for years, and in this case scale does not alter the basic economics of the argument.

CD-ROMs are an exception to this rule because of the massive reduction in their cost brought about by the scale on which system components are produced. The CD drive you buy for your server contains the same basic mechanism which you probably have in you home stereo system. The same factory which produces atonal music you hate can also produce copies of your company's favourite software package, including all manuals, etc. at about the same price that one or two floppy disks cost to manufacture. What's more, the CD can store the contents of several hundred floppies or the equivalent of one or two distribution tapes, and is for all practical purposes indestructible. The resulting software package is smaller and lighter than one with floppies and paper manuals, and so costs significantly less to ship and store. From the customer's point of view since the manuals are on-line very few full copies of the software are required. Licences are cheaper and always available. The result is that, if you don't already have one, you will find it expensive not to buy a CD-ROM drive very soon.

You will probably justify the purchase of your CD drive on the basis that it will be used to install software, which will cost less than floppy-based equivalents. Using a CD-ROM drive in this manner does not require its installation on a server. You can just as easily install it on a workstation and install the software on the server, preferably for download onto other workstations. Alternatively you could install your CD-ROM drive on a workstation running something like Windows for Workgroups, Windows NT or OS/2 which is capable of directly sharing a local device. You can then install your new software and bar shared access to the CD drive. Either of the above strategies have no lasting effect on network servers.

I find that useful criteria for deciding where on a network to install removable media — especially CD-ROM drives — are the uses to which the device is to be put, the number of people who will need to access it and the frequency of access. For example: software installation implies a single user and infrequent use, therefore install the device on a single workstation. A support database such as Microsoft's Technet CD will be in moderate use by a small number of people and, since Technet is updated quarterly, it will not be dismounted frequently, therefore install the CD-ROM on a server — preferably a small workgroup server which is for the exclusive use of the group requiring access to Technet. At the other end of the scale something like a company database, a CD containing telephone directories which is to be the subject of sustained high frequency access by a large number of users, or a CD containing high density data such as ABS statistics which will be the subject of heavy processing by a smaller number of users, belongs on a hard disk, preferably one with as much cache as possible.

"Useful criteria for deciding where on a network to install removable media . . . are the use to which the device is to be put, the number of people who will need to access it, and the frequency of access."

Vendors of CD-ROM jukeboxes often refer to their products as 'near-on-line' storage. All types of removable media are 'near-on-line' storage — how near to on-line depends on the device. If you are thinking of deploying such devices on your network you will do your users a service by carefully considering the practical implications of that description before you make your purchase.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

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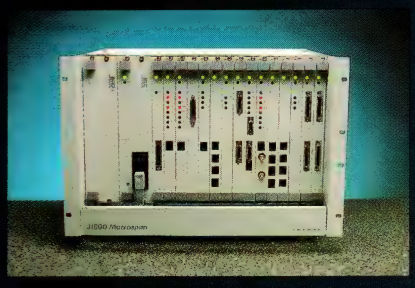

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Technology Update

Wollongong University Plugs in ATM

The University of Wollongong has purchased a SynOptics LattisCell Switch 10104 ATM switch, marking SynOptics' first ATM sale in the Southern Hemisphere. The switch will be used by the University's Advanced Telecommunications Research Program team for teaching, research and internal applications. Professor of Telecommunications Engineering at the university, Mr Gary Anido, said the university bought the SynOptics ATM switch because the product's internal networking configuration was applicable to their needs. The switch has a total capacity of 1.6Gbps, via 16-port directional inlets and outlets, which can each handle 155Mbps. It will provide the university with an experimental network, which will be used to test the viability of other network applications — both in laboratory and real-life settings. In addition to research applications, one practical application for the technology will be the conversion of the university's central lecture block to become a communications centre, providing multimedia capabilities and a television studio that will produce taped lectures for distance education students. The communications centre will act as a hub for conveying lecture material between the lecture theatre and the TV studio, as well as to other lecture rooms and, ultimately, to the campuses of other universities.

3Com Unveils Network Management Line

3Com has announced a new family of network management software known as Transcend, which the company claims represents a unique approach to network management in that it integrates network devices into logically related groups or objects, which can then be managed by a set of powerful application tools. Through object-oriented SmartAgent software, users can set up logical connectivity system structures which provide superior network control and simplify complexity, making it easier to visualise, analyse and manage network operation, says 3Com. Management is performed at the network level, rather than at the level of individual devices; for instance, a collection of heterogeneous devices can be viewed as a single 'black box,' simplifying administration. Rather than a mere topological grouping or association of similar devices, the logical connectivity systems correlate configuration, event and performance data from hub, bridge/router and adaptor agents, and present integrated actionable management information on a single graphical interface. Transcend will work with SNMP-managed products from other vendors, and support for RMON can be incorporated.

AT&T to Offer SNMP Support For PABXs

AT&T plans to offer an SNMP agent for its high-end PABX system, the Definity Communications System Generic 3, by early next year. The SNMP support will be in the form of a proxy agent that will be offered as a software option to AT&T's NCR Starsentry System. The agent will translate management information from Definity's proprietary format to SNMP, boosting its performance and AT&T's positioning of Definity as a switch for handling a wide range of multimedia traffic. Definity is already able to handle multimedia applications such as voice processing, videoconferencing and call-centre telemarketing.

IETF Revising RMON MIB

The Internet Engineering Task Force has decided to begin work on a major revision of the SNMP remote monitoring management information base. At a meeting in June, the IETF agreed to start work on RMON 2 as soon as possible, probably in January 1994. One of the proposed changes to RMON is the addition of network layer monitoring. The present version allows remote probes and network monitors to gather data link layer information for use by SNMP management stations. If network layer monitoring is included, a monitor would be able to identify each workstation on a LAN according to its IP network address, so it could determine how much protocol-specific traffic is contributed by each individual station and gauge the overall percentages of particular protocols in use on any LAN segment. An IETF spokesperson also said that a new version of RMON MIB could expand the degree of filtering a network probe is able to perform on traffic data.

Lotus Outlines New E-Mail Strategy

Lotus Development has given details of planned extensions to its electronic messaging strategy that will provide a cross-platform multiprotocol messaging service, a range of new messaging products, and a set of unified interfaces, message transfer and directory services across Lotus' communication products. Heading the new product releases will be the Lotus Communications Server (LCS), which will provide the messaging service based on Lotus cc:Mail and Lotus Notes technology and add native SMTP/MIME and X.400 transports and native X.500 directory support. The LCS will be delivered on a range of multitasking operating systems including Unix, Windows NT and OS/2, and will also be available as a NetWare Loadable Module. Despite including Microsoft MAPI support in this announcement, Lotus has reaffirmed its intention to continue support for its VIM (Vendor Independent Messaging) application programming interface.

signals. This would, of course, have then required some sort of demultiplexing/tuning equipment in the home — and multiplexing, switching and CAP modulation in the Active Pillar on every alternative street corner if the system were to provide access to the promised 200-odd cable channels.

The executives must have been smoking something rather powerful at the time: everyone else held firmly to the belief that, even with the best MPEG2 compression, you would need 4-8Mbps just for a single 'broadcast-quality' image — and nothing has happened in the interim for most observers to modify that judgement, although a lot of ADSL enthusiasts are convinced that we can get PAL-equivalent images down wires at 1.5Mbps.

The early street trials held by Bell Atlantic in the United States used CAP to transmit a single 4Mbps image stream. They were using MPEG1, which is the compression standard designed for FMV CD-ROMs and hard-disk video replay. Apparently the trials were pretty impressive (Scientific Atlanta showed similar ones to the politicians, via the Optus satellite at the time) as long as the scenes were chosen to create the least possible decoding problems.

MPEG1 has a resolution of about 240 vertical lines (as against 500 for PAL) and with about 350 horizontal lines (VCR quality) as against PAL's broadcast quality of about 450 lines — and it doesn't support interlace scanning. The problem with MPEG1 at low bit-rates like 1.5Mbps (apart from its image quality), is that it is intolerant of sudden image changes.

The original CAP ADSL(I) later reappeared in a couple of new forms based on 16-level PAM (Phase Amplitude Modulation) called variously ADSL II and ADSL I Part 2, and ADSL II Part 2 — it got very confusing at the time. The modulation technique was still called CAP but promised higher data-rates over shorter distances. Later, the entirely new DMT modulation technique came along, and in March 1993, the ANSI committee voted overwhelmingly to use the DMT approach for ADSL — although both AT&T and AWA seem to feel that CAP is still a valid option.

Seeing DMT

These DMT techniques are closely related to OFDM (Orthogonal Frequency Division Multiplexing) which was developed for Digital Audio Broadcasting (DAB) and now being trialled for terrestrially-transmitted digital TV. DMT has 256 simultaneous tone carriers (separated by 4kHz). These CAP and DMT signals were all originally to be carried through the ducting back to the exchange using frequencies between 100 and 500kHz (0.5MHz), but the expectations have now reached just over 1MHz.

This is what many can't understand; the inside of these ducts with a few hundred

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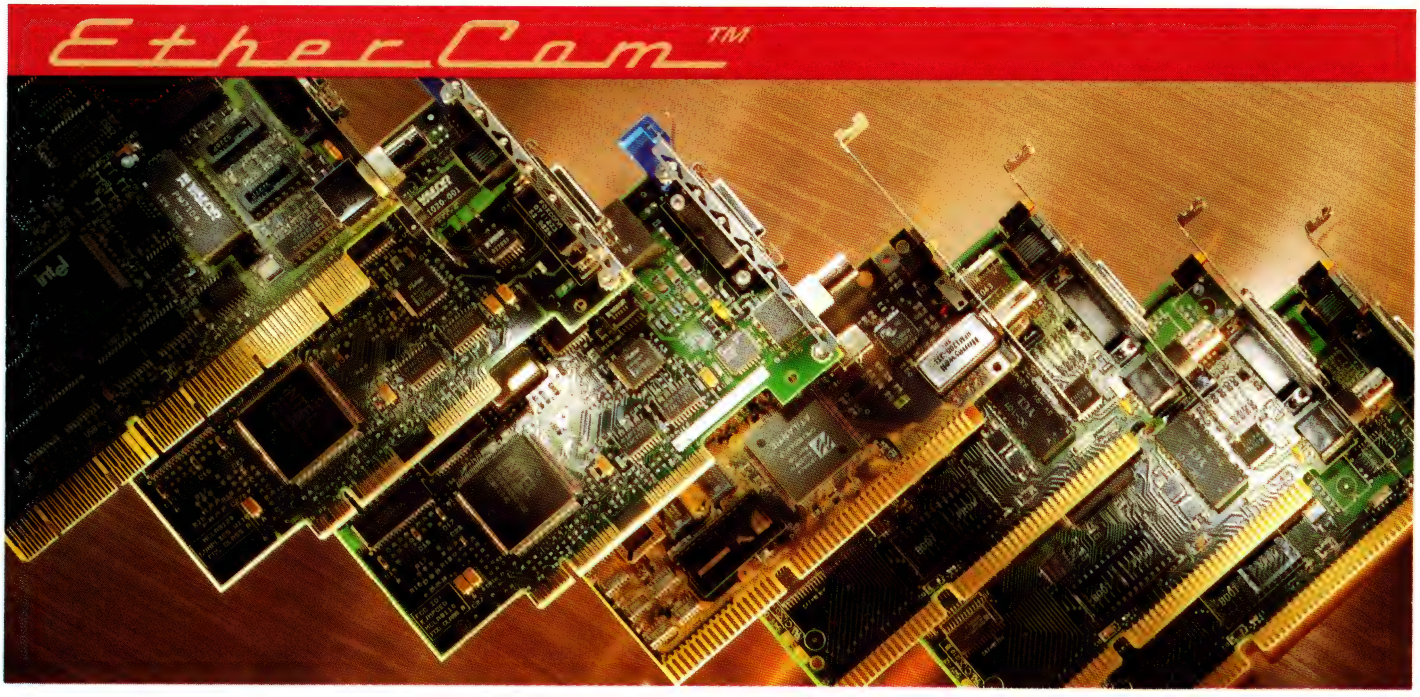

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Bandwidth-to-the-Home

Telecom Gets Serious About ADSL

The video-over-copper-claims industry is hotting up. Telecom (or rather, what remains of its Research Laboratories) has just awarded a $1 million contract, for 'test equipment' to run an ADSL (Asymmetrical Digital Subscriber Line) trial, to AWA 'to evaluate the potential for pay TV and other video services.' This contract includes the supply of the encoder/decoder and the ABC-designed D-Cart hub unit for experimental video-on-demand.

What's more, Telecom has shortlisted four (of an original 24) tenderers for 'volume supply' of ADSL equipment into a million Australian homes. AWA is bidding with Siemens for this contract, and they're up against Jtec bidding in association with AT&T, and sundry others like Philips, Alcatel, NEC, British Telecom (BT) and Ericsson in publicly-undefined groupings; apparently if you are a preferred supplier of SDH equipment, then you have some standing as a tenderer here.

In September, Telecom called for expressions of interest in constructing a hybrid (fibre/copper) network in some high-density residential areas of the main capital cities — and it indicated that ADSL was the preferred choice of modulation techniques. This is obviously a move to pre-emptively establish a fibre-presence in these 'cream-skimming' areas of the future before open competition arrives in 1997.

So ADSL is the rage. ADSL is the way of the future for Pay TV over telephone wires. And, as Ben Potter in *The Age* reported: 'There could also be export opportunities if Telecom introduces ADSL into Australia ahead of most other countries.' These opportunities are probably related to the export bonanza we gained from being the first in the world with digital satellite Pay TV, and from being the first in the Southern Hemisphere with GSM.

Anyway, these are the current ADSL press stories, which are flowing thick and fast from a flurry of press releases, private briefings and announcements. But let's look at the claims in detail.

Confusing Claims

First of all, Telecom is apparently taking bids to establish hybrid coaxial networks in the central residential areas of Sydney, Melbourne and Brisbane. It says it would prefer an ADSL system, but the whole point of laying coaxial is that it is capable of carrying POVS — the Plain Old Video Service called analogue PAL.

Then Telecom apparently has about half the world's electronic manufacturers bidding on volume supply of digital demodulation equipment to a million homes, at a time when its own trial hasn't even proved the feasibility of the ADSL technology, and when the international standards aren't yet settled. God knows what these companies will be bidding on; only one of the proposed sub-standards is in silicon, and this is a multiple chipset just out of the early lab trials. One guess is that they are bidding on the basis of technical clout to remain on the list of preferred suppliers.

And if ADSL is moving into the volume-supply phase, why is Telecom still moving ahead with optical fibre and coaxial in the streets? ADSL's supposed advantage is that you can pump it down 'existing' copper pair — over the local loop twisted-pair already in the ground. As John Riedl of Jtec says: "ADSL is only a transition technology on the way to the 'ultimate' — fibre. So this is primarily a cost issue. If ADSL is only providing a transition to expensive fibre, [then] it needs to be available soon, and it needs to be cheap."

But Telecom still seem to be building new 'hybrid' networks with an optical fibre feed to a Fibre Serving Area (FSA), then with service lines running out from the FSA's 'Active Pillar' (sub-exchange) to each home. And, if you are going to build these as a new overlay network, then you wouldn't use ADSL over twisted-pair — you'd use analogue video over coaxial just on a cost basis.

They would amplitude modulate at the FSA's Active Pillar, and then switch the video down the coax for the last half kilometre, and so avoid all the problems of domestic digital demodulation. With switched video systems you don't then need a complex IRD (Integrated Receiver/Decoder) as is needed with MDS and satellite feeds to select and unscramble the picture, since they can bill you just like a telephone call, for usage. Switched Pay TV doesn't need scrambling.

And analogue over coax doesn't need compression. With the ADSL home delivery, the video signal must be carried in MPEG2 compressed form with all the decompression and error-correction electronics that that entails. Analogue AM modulation can deliver Pay-channels which are selected, just like the off-air channels, by using the normal TV tuner.

Capping Them All

You'll also notice that AT&T is just one of the bidders (with Jtec) for the ADSL volume supply contract, and yet it was AT&T's subsidiary Paradyne which supposedly invented the ADSL system. You'd think that, by owning the patents, they would have some sort of front-running. Well, perhaps they do!

What's more AT&T also has the only commercial 2Mbps exchange switch now in production. Don't forget that with any video-over-copper system you will need some sort of switch on the front end of the last-kilometre cable to select the video stream from the 200 or so being delivered to the Active Pillar or the exchange. In fact, you would think that AT&T could use their ADSL patents as a supermarket 'loss-leader' and sell the switch/ADSL combination in a package that no other company could match.

Jtec/AT&T are promoting an ADSL modulation technique called CAP, while the others are promoting an alternative called DMT. CAP was the original standard everyone made a fuss about nine months ago, but DMT has now been selected by ANSI (American National Standards Institute) as the preferred technology. In fact, AT&T itself voted in favour of DMT — even though it now sees its market advantage out of using CAP.

John Riedl says that AT&T originally owned the patents for DMT as well as CAP, but it: "let them lapse in favour of CAP because they thought DMT was too complex to implement. So [DMT] may well be a standard, but we won't see it until 1996-97, and it may be still-born."

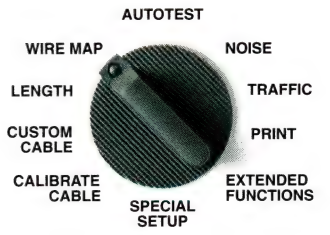
This, as Alice said at the Pool of Tears, gets curiouser and curiouser! So in the year since ADSL was 'invented' by Paradyne, it has undergone some rather radical changes. 'ADSL' is now a generic term for anything capable of providing VCR-quality-video feeds over copper pair — and the two contenders are CAP (Carrier [or Carrierless] Amplitude/Phase modulation) with two flavours, and DMT (Discrete Multi-Tone).

The underlying technology that AT&T originally announced as 'revolutionary' in July 1992 was CAP using 4-level variation on QAM (Quadrature Amplitude Modulation) techniques. CAP is a two-dimensional line code that is closely related to QAM, and is said to be easily implemented on DSP or VLSI chips. Back in 1992, ADSL was CAP plus a lot of error checking.

Both 'carrier' and 'carrierless' seem to be used here as synonyms. Rob Nicholls of AWA explains that "the carrierless aspect of the modulation scheme is probably best visualised as being a QAM modulated carrier with a centre frequency of zero, and the negative frequency spectrum literally disappearing, as there is no such thing as negative frequency."

At the time, it was claimed that CAP was said to have a capacity of 10Mbps over short cable lengths, and 1Mbps over twisted-pairs up to 5 kilometres long — although about 1.5Mbps for average suburban home feeds (up to 2 kilometres) was generally accepted to be the practical limit for quad in the streets.

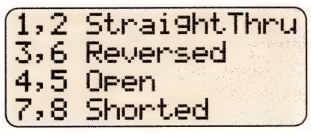
Telecom's executives told the Senate Inquiry into Pay TV in August 1992 that this would be enough to deliver three or perhaps four simultaneous broadcast-quality video



Simply twist the rotary knob to select the function you need. It's easy, intuitive, and eliminates having to hassle with multi-level menus and complex keypads.

Click.

Beep.



In seconds, a beep alerts you to correct operation and pass/fail results. The sharp 64-character display gives you cable measurements automatically.

Whirr.

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By and large, most testers are powered by 9-V batteries, although a few use factory-installed batteries that must be recharged with an AC adaptor. But be careful: vendor claims about battery life aren't always an accurate guide to performance. Thus, a vendor may claim a battery life of eight hours, but the unit may actually be able to deliver only three or four hours of sustained testing. Most cable testers come with remote units, devices roughly the size of a pack of cigarettes, that attach to connectors at the far end of a length of cable and help with various tasks. There are two kinds of remote units. Passive ones, sometimes called loopback units, simply reflect a signal back to the cable tester. Active units, sometimes called injectors, can initiate signals on their own, which allows the cable tester to measure performance at either end of a connection, instead of at one end only.

Remote units are typically included with the price of the tester, but the number required varies among products. Sophisticated testers geared to high-frequency data cables may need more injectors than simpler scanners.

Some handheld testers also may require special adaptors and patch cords, depending on the tests being performed. In general, the faster the cabling, the more complex the test gear. For example, in order to certify compliance with Category 5 — the 100MHz UTP cabling able to support 100Mbps Ethernet and other high-speed technologies — components are needed that can cope with higher frequencies and bigger bandwidth.

The High Five

"The 100MHz rate of Category 5 cable requires a tester to run faster and make a broader sweep of the wire," says Darrell Johnson, General Manager of Wavetek's Instruments Division. Johnson also notes that Category 5 testers must be more accurate, since glitches that would be insignificant at low speeds can wreak havoc with network traffic at high speeds. "There's less signal margin at high frequencies than low," he says. This requires special patch cords, connectors, and adaptors to ensure accuracy.

To make matters even more complicated, Category 5 certification requires more processing power, since each of the four twisted pairs inside the cable must be tested for attenuation, crosstalk, and other conditions. And the tests must be repeated at a variety of frequencies. Further, for a condition like near-end crosstalk that affects wiring pairs, the worst possible combination must be identified. All this means adding complexity to the handheld cable tester.

For all that, there isn't necessarily a one-to-one relationship between a cable's ability to send and receive electrical signals at certain frequencies and its ability to handle data at certain rates. For example, cable that can handle 100MHz signals usually will be able to handle data to 155Mbps, one of the rates specified for ATM (asynchronous transfer mode) networks. In order to meet the requirements of ATM and other standards, specific lengths of cable must be able to sustain electrical signals at given frequencies without losing strength or quality.

And some users question the ability of handheld units to do a good job of testing near-end crosstalk at high frequencies. According to AT&T's Bartolutti, when handheld testers were introduced several years ago, some of them actually contributed near-end crosstalk to the measurements they were taking. The trouble could be traced to the fact that circuitry inside the testers wasn't adequately isolated from the cable being tested. In effect, the tester would add its own internal near-end crosstalk to whatever it found on the cable. Over the past few years, Bartolutti says, vendors have provided crosstalk cancellation circuitry to resolve the problem. But Bartolutti feels that it's tough enough to test near-end crosstalk in a laboratory; doing it with a handheld, self-powered device may be asking too much. He's still leery about completely trusting near-end crosstalk measurements taken by handheld testers above 10MHz.

Finally, while most of the attention these days is focused on products that test coax and phone cabling (UTP and STP), vendors like Hewlett-Packard also offer cable testers for high-speed fibre.

Two and Counting

It's tough to nail down a set of criteria for judging network testers, since this is still such a young market. Just two products, the Fluke 670 and Scope Communications' Framescope are actually shipping.

Despite this dearth of activity, vendors are convinced that this business sector is poised for take-off. "Our marketing research indicates that users want tools that combine features of protocol analysers, such as utilisation statistics, token rotation time, connectivity tests, and fault domain isolation," says Mark Mullins, LAN products marketing manager at Fluke. What users don't want, he says, are the weight, size, and technical complexity of a protocol analyser.

The Fluke 670 identifies a range of errors on 4 or 16Mbps Token Ring LANs, including beaconing and phase jitter. It also tests cable length, impedance, and split pairs; maps connector wires; and identifies the various cables in a segment. As well, it can check out lobes, stations, adaptor cards, hubs, and concentrators.

The current version of the Fluke 670 works only with Token Ring. The reason, according to Mullins, is that diagnostic in-

Continued on page 50

Cable Talk

Ambient Noise — Signal interference that results when communications cable is placed close to or intersects other electrical fields, such as those generated by power cables, elevators, microwave equipment, or other gear in wiring ducts.

Attenuation — A lessening in the strength of a signal as it travels along a cable. Typically measured in decibels of signal loss (the smaller the measurement the better), attenuation varies with the type of cable and the rate at which data is sent.

Capacitance — The ability of a cable to carry a signal without distortion; usually measured in farads.

Impedance — A measure of the opposition to the flow of electric current in a cable. Related to resistance, impedance is given in ohms and depends on frequency.

Link-bit Test — A test of the electrical signals particular to specific types of LAN topologies. (10Base-T networks, for example, issue specific bit patterns when establishing data links among stations).

Near-End Crosstalk — NEXT is a condition in which the signal being transmitted over one pair of wires is so strong that it radiates onto the wires assigned to receive information. Usually occurs at points in the network where transmission signals are particularly strong, such as where LAN adaptor cards connect to LAN cabling. NEXT measurements are usually given in decibels.

Open — An open circuit from cable being broken or improperly terminated or connected.

Phantom Voltage — In Token Ring networks, the electrical signal from a network device or workstation that opens the relays on the concentrator or MAU and allows the station to join the ring.

Remote Test Unit — A device used with handheld scanners that attaches to the far end of a cable being tested. Passive remote testers simply reflect the signal; active test units also are capable of generating signals in order to test attenuation.

Sensitivity — In decibels, the faintest electrical signal a tester can measure. This is a gauge of the ability of a tester to pick up small signals in the presence of electrical noise.

Short — A short circuit, one in which two cables are connected where they should not be.

Signal Margin — The sensitivity measurement that results when values for attenuation and near-end crosstalk are subtracted from a signal injected onto a cable.

Signal-to-Noise Ratio — In decibels, the ratio of cable signal strength to background noise.

Time-Domain Reflectometer — A TDR is an instrument or component that sends out an electrical pulse and measures the time it takes to return to the originating device.

Wire Map — A feature of handheld testers that allows them to check how well cabling connects to the individual pins in a connector.

CUSTOM CERTIFICATION	ATTENTUATION	CAPACITANCE	NEAR-END CROSSTALK (NEXT)	TESTS STORED	WIRE MAP	CABLE LENGTH	AMBIENT NOISE	REMOTE TEST UNIT
No	No	No	No	None	No	No	No	None
No	No	No	No	None	No	No	No	Passive
Yes	Yes	No	Yes	50	Yes	Yes	No	Passive
Yes	Yes	No	Yes	500	Yes	Yes	No	Passive
No	No	No	Yes‡	None	Yes	No	No	Passive
Yes	Yes	No	Yes	50	Yes	Yes	Yes	Passive
Yes	Yes	No	Yes	500	Yes	Yes	Yes	Passive
No	No	No	No	200	No	No	Yes	None
No	Yes	No	Yes	50	Yes	Yes	Yes	Active
No	No	Yes	No	None	Yes	Yes	No	None
No	Yes	No	No	9	Yes	Yes	Yes	Active
No	No	No	No	9	No	Yes	Yes	None
No	No	No	No	None	Yes	No	No	None
Yes	Yes	No	Yes	Last test	Yes	Yes	Yes	Passive
Yes	Yes	No	Yes	50	Yes	Yes	Yes	Active
Yes	Yes	Yes	Yes	500	Yes	Yes	Yes	Active
No	Yes	No	Yes	Last test	Yes	Yes	Yes	Passive
Yes	Yes	Yes	Yes	100	Yes	Yes	Yes	Active
Yes	Yes	Yes	Yes	100	Yes	Yes	Yes	Active

‡But only to determine the existence of split pairs

Cable Considerations

To test compliance, users simply press a key or type in a command to request certification. The cable tester either performs the necessary measurements automatically (a feature known as 'autotest') or prompts the user to set up the tests. Results are typically presented in a matter of minutes, along with 'Pass' or 'Fail' messages, on the instrument's tiny screen. In order to retain measurements, most testers have small amounts of memory; some have ports that let users download test results to printers or PCs.

Vendors also are working on ways to make cable certification tests even easier to perform. The new Pentascanner, a 100MHz handheld cable tester that Microtest plans to ship by the end of this year, will automatically give the user a list of certifications for a particular length of cable. Just as important is the ability to handle so-called custom certification, in which a user makes a series of measurements on a cable that is known to perform optimally and then stores those parameters to use as a point of reference during later installations.

And some manufacturers even offer user interfaces in different languages. Microtest, for example, sells versions of its MT310, MT350, and soon-to-be-released Pentascanner that display findings in English, German, French, or Spanish. Wavetek also offers testers with a German user interface.

Hand Signals

To carry out the actual evaluations, cable testers rely on internal circuitry like frequency synthesisers, time-domain reflectometers (TDRs), link-bit testers, voltage control oscillators (VCOs), and application-specific integrated circuits (ASICs) that synthesise and measure the performance of signals. Handheld testers plug into a length of cable wherever there is a connector — where a workstation's network interface card plugs into the LAN, for instance, or at a patch panel, punchdown block, or hub.

Handheld LAN Cable Testers

VENDOR	PRODUCT	DISPLAY TYPE AND SIZE	PRINTER PORT	CABLE TESTED	MAXIMUM FREQUENCY TESTED	CERTIFICATION
Australian AMP (02) 680 3377	Thinnet Tap Tester	LED	No	Thin coax	N/A	None
Bytex JNA Network Services (02) 417 6177	Ringout Cable Tester	LED	No	STP,UTP in Token Ring	N/A	None
Datacomm Technologies Nilsen Instruments (03) 419 9999	LANcat 1500	4-line, 16-char LCD	Yes	coax, UTP	10MHz	Ethernet, 4Mbps Token Ring
	LANcat 1800	4-line, 16-char LCD	Yes	coax, STP, UTP	20MHz	Ethernet, 4Mbps Token Ring
John Fluke Mfg Philips Components (02) 805 4455	Fluke 610	LED	No	UTP	10MHz	None
	Fluke 650	4-line, 16-char LCD	Yes	coax, STP, UTP	10MHz	Ethernet, Token Ring
	Fluke 652	4-line, 16-char LCD	Yes	coax, STP, UTP	20MHz	Ethernet, Token Ring
Hewlett-Packard 13 13 47	Multimode and Single-mode FDDI Test Sets and STP FDDI Test Set	2-line 16-char LCD	Yes	Single and Multimode-fibre STP	N/A	FDDI
	HP Cable Test Set	2-line, 16-char LCD	Yes	coax, STP, UTP	20MHz	Ethernet, Categories 1-4†, Token Ring
	Quick Scanner	2-line, 16-char LCD	No	coax, STP, UTP	N/A	None
	Pair Scanner	32-digit 2-line LCD	Yes	coax, STP, UTP	10MHz	10Base-T
	Cable Scanner	32-digit 2-line LCD	Yes	coax, STP, UTP	N/A	Ethernet
	Ring Scanner	LED	No	coax, STP, UTP	N/A	None
Microtest Com Tech (02) 317 3088 INS (02) 906 6335 Computer Systems Services (049) 675 266	Microtest MT310	2-line 16-char LCD	No	coax, UTP	16MHz	Ethernet, Token Ring, 10Base-T
	Microtest MT350	2-line, 16-char LCD	Yes	coax, STP, UTP	20MHz	Ethernet, Categories 1-4†, Token Ring
	Pentascanner	4-line, 189-char backlit LCD	Yes	coax, STP, UTP	100MHz	10Base-T, Token Ring, ARCnet, AppleTalk, ISDN, T1, fast Ethernet, Categories 1-5†
Scope Communications LANcon (02) 899 3033	Scope Wirescope 16	2-line, 16-char LCD	Yes	STP, UTP	16MHz	Ethernet, Token Ring, Categories 2-3†
Wavetek Scientific Devices Aust (03) 579 3622	Wavetek LANtech 10	4-line, 16-char LCD	Yes	coax, STP, UTP	20MHz	Category 4†
	Wavetek LANtech 100	4-line, 16-char LCD	Yes	coax, STP, UTP	100MHz (UTP, STP); 20MHz (coax)	Category 5†, UL Level 5

†To EIA/TIA 568

tests that handheld tools have yet to master." He thinks it's still too soon to completely trust the near-end crosstalk measurements taken by handheld cable testers above 10MHz. Microtest's Bolles disagrees: handheld test equipment has come a long way already, he says, and there's no doubt it will evolve to meet users' expectations.

Cable testers vary in the number of evaluations they perform, degree of detail they deliver, and types of certifications they provide. Most can quickly identify wiring problems like short and open circuits, but only the more sophisticated tools can properly measure attenuation, near-end crosstalk, or ambient noise. Many high end tools also offer a feature called wire mapping, which verifies that cables are properly attached to various standard connectors.

Some testers can also generate signals to test how cables respond as hubs or MAUs (media access units) are added to a LAN.

The current crop of cable testers spans a fairly broad range of prices and capabilities. On the low end are relatively simple, inexpensive tools like the Ring Scanner from Microtest, Ringout Cable Tester from Bytex and Thinnet Tap Tester from AMP. These low-end units, often referred to as 'scanners,' generally cost less than $2,000 and report the most basic flaws, such as nonconductive twisted pairs and open circuits.

More sophisticated cable testers can help determine whether premises wiring can handle different network topologies by measuring various line conditions and automatically matching the results against standard performance benchmarks stored in memory. Products like the LANcat Series from Datacom Technologies, HP Cable Test Set from the Network Test Division of Hewlett-Packard, Fluke 650 and 652 from John Fluke Manufacturing, MT310 and MT350 from Microtest, and LANtech 10 from Wavetek give users an easy way to check if their LANs meet important cabling standards, such as those set by the US EIA/TIA and, by extension, Standards Australia.

LAN Testers

Handheld LAN Testers Get a Grip on Internetworks

Corporate network managers best skip the movie version of *The Fugitive* — they already know all too well what it's like to be on the run. Every time they turn around it seems as if there's another Token Ring or Ethernet segment that needs to be tied into the enterprise backbone. And many of them now face massive rewiring efforts in a race to get ready for fast Ethernet, FDDI-over-copper, and ATM.

Relief may be just over the next riser. Even as internetworks are growing bigger and meaner, the diagnostic tools that net managers rely on to keep their LANs up and running are getting smaller, cheaper, and simpler to use. These days, in fact, there's no shortage of handheld LAN test gear that can tackle jobs like cable installation and problem diagnosis, once the exclusive purview of high-priced protocol analysers and high-paid personnel.

Handheld LAN tools fall into two categories: cable testers and network testers. Cable testers, by far the largest group, give users quick access to physical-layer information (see table). These devices — typically about the size of a cellular phone — contain time-domain reflectometers, link-bit testers, and other circuitry to rapidly identify cable conditions like electrical noise, attenuation, and near-end crosstalk.

Handheld network testers (also known as data testers) are still rare. Only two products have been announced: The Fluke 670 LANmeter from John Fluke Manufacturing and the Framescope 802 from Scope Communications. These units access media access control (MAC) layer information about LAN traffic and deliver a range of handy statistics about performance, utilisation, and packet errors.

For all their promise, though, handheld equipment is meant to supplement rather than supplant other LAN diagnostic gear. Protocol analysers, network monitors, and net management systems remain the heavy artillery of diagnostics and maintenance. What handheld test tools can do is make it possible to rely a bit less on these big guns.

According to Michael Combs, product manager at Scope, handheld test equipment can help non-specialists resolve more than 90% of common network problems.

"You can't resolve a cable problem from a protocol analyser or net management system," adds David Bolles, President of Microtest, by most accounts the market leader in handheld test equipment.

Still, not everyone is equally sold on flyweight testers. Some users are concerned that shrinking sensitive test components means sacrificing accuracy — at least in some respects.

"Handheld testers are valuable for determining characteristics like cable length, attenuation, opens, shorts, and other basic features of a wire," says Steven Bartolutti, a technical staffer at AT&T Network Cable Systems in the US. "But there are still some

Categorical Imperatives

Leading vendors of handheld cable testers say they're overwhelmed with orders for products that help determine compliance with EIA/TIA-568, the group of network cabling specs ratified by the US Electronics Industries Association/Telecommunications Industries Association (EIA/TIA) in 1992. (Standards Australia has adopted the US standard, rebadged it for Australia and issued it as AS 3080.)

EIA/TIA-568 (AS 3080) classifies a range of cable types according to their role in a network. It establishes three categories of unshielded twisted pair (UTP) and also classifies shielded twisted pair (STP), coax, and fibre optic cable.

The basic EIA/TIA-568 specifications, and a related document called EIA/TIA-569, defines how different types of cabling are to be installed within a building, including the design of the ducts and raceways. Two Technical Systems Bulletins (TSBs) add to EIA/TIA-568 without actually being part of the standard. TSB-36 specifies cable parameters; TSB-40 defines hardware and connectors to be used with specific cables.

Each type of cable covered by EIA/TIA-568 must be able to maintain voice or data signals at rates ranging from 10Mbps to over 150Mbps under a variety of environmental conditions (including temperature). The specs cover the physical characteristics of cabling: It's up to net managers to determine the suitability of each category of cabling to specific types of LANs, like Ethernet or Token Ring.

For many network managers, EIA/TIA-568's Category 5 UTP is currently the top cabling contender since it can be used in most of today's networks and can also work with faster LANs. Category 5 UTP defines 100 ohm, four-wire twisted pair copper cable capable of handling data to 100Mbps.

The EIA/TIA-568 specifications have one major drawback: they only deal with standalone cables and connectors; no performance figures are established for cabling that is actually connected to networked devices such as patch panels, hubs, and workstations. In general, however, connected cable performance won't measure up to that of a length of raw cable.

"The current standards are great if you're a cable supplier," says Mark Johnston, Microtest's business unit manager for cable management products. But, he says, there's not yet an approved method for measuring Category 5 links in the real world. For instance, there's no way to certify that a link running from the back of a network interface card to a connector or from a wall plate through a patch panel to a punchdown block actually conforms to Category 5.

For just that reason, the EIA/TIA is working on a revised version of the standard that will include performance parameters for networked Category 3, 4, and UTP. The new specs — designated EIA/TIA-568A — also will spell out acceptable levels of performance for networked connectors. The network parameters will be included in an addendum or 'informational annex' to the new standard that users can ignore if they so choose. Sources say that if all goes smoothly, the final version of EIA/TIA-568A should be ready for publication by the start of 1994.

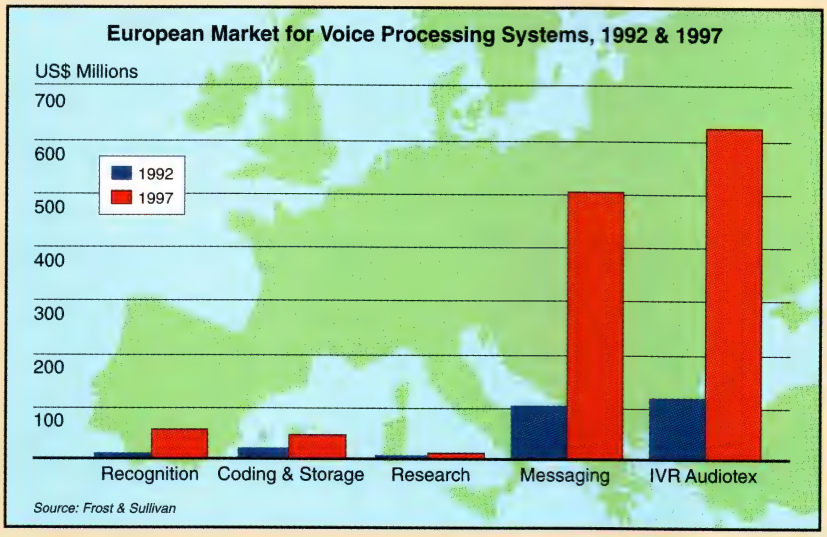
Other standards are starting to appear. US-based Underwriters Laboratories already has its own set of cable standards, but a group of users and vendors has successfully lobbied UL to make the UL specs conform exactly to those of the EIA/TIA-568. By January 1994, UL says, various differences in nomenclature, temperature parameters, and other areas will be corrected to match EIA/TIA documents. UL says it has no plans to adopt the addendum at present.

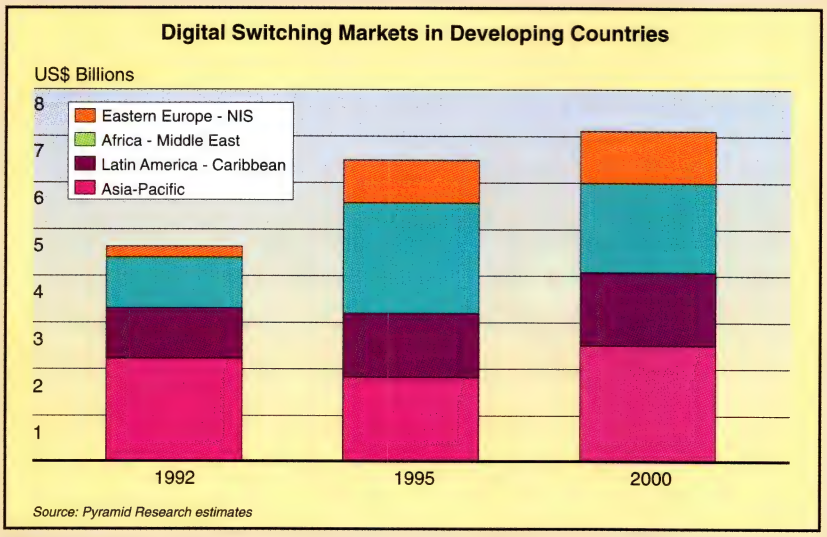
These EIA/TIA and UL specs represent the first standard guidelines for installing premises wiring. Together, they give users a greater number of products to choose from, because a standards-based market gives vendors a common ground to compete with the likes of AT&T, DEC, IBM, and Northern Telecom — the manufacturers that dominated the premises wiring market before standardisation.

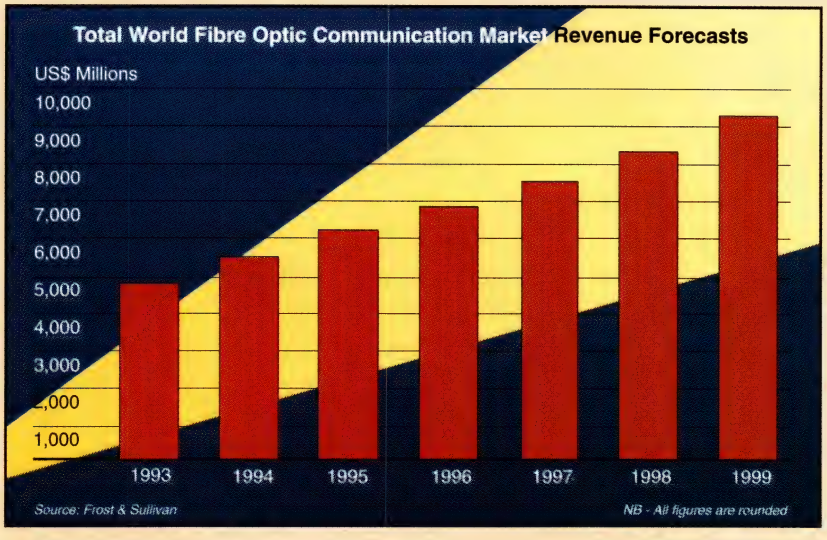
The EIA/TIA and UL spec aren't international in scope, but a group of EIA/TIA members have formed what they call the US Technical Advisory Group, which will take the information in its specs first to ANSI for approval and then to the ITU-T (International Telecommunication Union-Telecommunications, formerly CCITT).

Mary Jander

Market Watch







The new extensions to the T.30 fax protocol allow users to enter machine-readable recipient addresses along with the fax phone number when they send documents to fax servers. The address includes an eight-bit identifier and a 20-digit facsimile information field (FIF), which was incorporated into T.30 last year.

Under the routing scheme proposed by TR-29, the sender of a fax enters the routing address along with the destination fax phone number prior to transmission (see the figure on page 27). This address, which makes up the FIF, is not used to establish a call over the public network; instead, it is encapsulated in the T.30 protocol and sent along to the receiving fax server during the handshaking process. The receiving fax server retains the address for use after the fax document is received and the call completed, and the fax server at the receiving end retrieves the routing address and matches it to its routing table. Once the recipient is identified, the server sends the fax document to that user, via e-mail or some other application set up to handle such routing.

Although the network address has been specified within the T.30 protocol, there are still several issues to be resolved concerning its use. One involves establishing a conventional way for users to enter the address. For instance, several Japanese vendors have proposed that spaces be used to fill out unused parts of the FIF. Indications are that this approach will be adopted by the ITU-T Study Group 8 at its next meeting, scheduled for this month.

Makers of PC fax boards and fax servers expect T.30 routing to be fully deployed within the next 12 months. US PC fax board makers Brooktrout Technology and Gammalink anticipate adding T.30 routing enhancements by early next year.

In the Chips?

The success of the new routing standard depends in part on whether suppliers of fax modem chip sets implement the standard. In fax modem chip sets, T.30 features are handled by a separate ROM chip. Yamaha, one supplier of fax modem chip sets, says it will begin phasing in the new T.30 routing features soon. But Rockwell International hasn't set a timetable for deployment.

Glen Griffith, Director of Worldwide Systems Engineering at Rockwell, says he isn't aware of any specific demand for the new T.30 features, adding that support would be driven by customer requirements. He says Rockwell provides T.30 support only for its PC fax chip sets because makers of standalone fax machines typically control the protocol aspects of their products.

Reaction to the T.30 routing extensions among makers of standalone fax machines has been more studied. Canon, the only

Continued on page 50

Fax Servers Get a Routing Standard

A new standard for routing documents to networked users could help fax servers find their way onto more corporate LANs.

A major obstacle blocking user acceptance of facsimile servers for LANs is about to fall now that standards groups are hammering out specifications for routing transmitted faxes to networked PCs.

The routing specs are expected to gain formal approval early next year, but products based on them may begin appearing by the end of this year. The arrival of a routing standard should gradually eliminate the proprietary and largely incompatible routing methods now used by fax servers to deliver documents to networked users.

Vendors of PC fax boards and fax server products are counting on the routing standard to invigorate what has been a dormant market. Although sales of PC fax boards are climbing — last year, fax board sales exceeded sales of standalone fax machines for the first time, according to market researcher BIS Strategic Decisions — fax server sales continue to fall short of expectations.

The proposed specifications are an extension to the T.30 fax protocol updated last year by the CCITT (now known as the ITU-T) T.30, part of the Group 3 fax standard approved by the CCITT in 1980, governs the signal exchanges used by fax machines to establish a session.

Work on the routing extensions is being handled by the TR-29 Facsimile Systems and Equipment Engineering Committee of the US Telecommunications Industry Association (TIA), the group responsible for fax standards within the US. The TR-29 committee expects its proposals to be approved by the TIA early next year. The committee also will submit its proposals to the ITU-T Study Group 8, which sets international standards. One of the main driving forces behind the T.30 routing extensions has been the International Computer Facsimile Association (ICFA), a trade group whose membership includes most of the key players in the computer fax industry as well as major PC software vendors like Microsoft and Wordperfect.

But the arrival of the routing standard won't necessarily guarantee a place for fax servers on corporate LANs. For one thing, the millions of facsimile machines now in use around the world can't accommodate the routing scheme without a hardware fix, which means widespread implementation of the standard could take years. And while most makers of PC fax boards, fax servers, and fax modem chip sets are lining up quickly behind the TR-29 routing proposal, vendors of standalone fax machines are taking a much more cautious approach, waiting for final approval before committing to deployment.

Market dynamics aside, some sticky technology issues need to be resolved for fax servers to present an attractive alternative to standalone fax machines. Many of these have to do with the graphical nature of fax documents. For instance, because fax documents are stored as bit-mapped image files, they require lots of disk storage space and take longer to print than conventional text files. The text contained in these image files can't be edited electronically unless the files are first printed out and run through a text scanner. Fax server vendors say they are working on these problems, but solutions don't appear to be imminent.

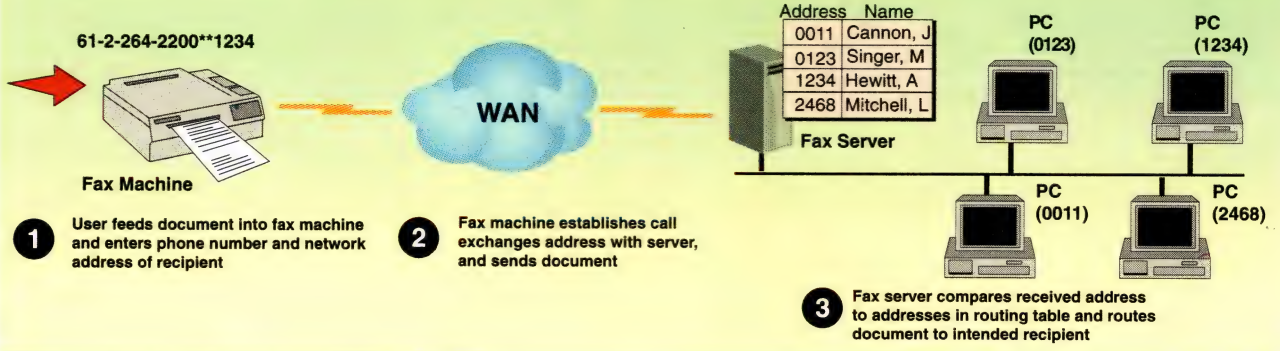
Server Genesis

The routing extensions to the T.30 protocol standard are an effort to bridge the gap between conventional fax communications and corporate LANs. The Group 3 fax standard governs point-to-point transmissions of image documents over the analogue public telephone network. The T.30 protocol within Group 3 specifies a standard mechanism for exchanging signals about the attributes of the two fax devices involved in a session.

Because it is limited to point-to-point transmissions, the Group 3 standard does not include any provisions for handling multiple addresses in machine-readable form. Under the original Group 3 standard, any routing is done manually, using cover sheets that are transmitted as part of fax documents. Vendors of fax server products have come up with several ways to handle document routing, all of them proprietary and none particularly effective.

Fax Routing, Step by Step

Under the ITU-T's proposed routing standard for fax servers, an address field is appended to the server's phone number prior to transmission (1). The address is passed to the receiving server during the session handshake (2) and used by the server to find the intended recipient once the transmission is completed (3).



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MIXED-LAN MAX AWARD

SMC 23RD ANNIVERSARY

STANDARD MICROSYSTEMS CORPORATION

networks by Deutsche Bundespost Telekom in the region means that demand for VSAT services is declining within Germany; operators are turning their attentions eastward.

Poland is taking a different tack with VSAT deployment, hoping to establish Polish companies as pan-European VSAT operators in the long run. Thus, the Polish government's licensing fees are aimed at discouraging foreign VSAT operators and encouraging Polish ones.

The Polish policy is already paying off. This past June, US firm GTE Spacenet Corporation announced a contract under which its Skystar Plus technology will be used in one of the biggest two-way VSAT networks in Europe, a 400-dish project serving Poland's banking and insurance industry. Another Polish company, Telekommunikacja Satelitarnia SA, is already offering domestic VSAT services to its customers using GTE Spacenet technology.

Eastern Europe's new governments deserve a lot of credit for encouraging the rapid introduction of so many services for private networks. It's been less than four years since Lenin's concrete clones were swept away. In that short time free enterprise has already managed to establish its own monuments, chief among them, the corporate network.

Elke Gronert and Peter Heywood

UK PCN from page 18

don at present, whereas the analogue networks have full national coverage. But the One-2-One network will cover a quarter of the population by April 1994.

Cellnet and Vodafone both reacted to the PCN tariff announcement by dropping their consumer tariffs by 15%, launching lower rate business tariffs within the London area and instituting discount schemes for high volume users. Both networks are at last being forced to react to competition.

Vodafone already has its GSM network in operation, and responded with an additional package providing low cost calls from within a designated local area, not restricted to London. The MetroDigital service uses the cell broadcast feature of GSM to allow subscribers to specify a 'home cell' within which calls can be made at a cheap rate. The concept was part of Vodafone's GSM rollout plans, but the timing of its introduction was prompted by Mercury One-2-One. Cellnet is planning similar regional calling packages when it launches its GSM network next year.

But Mercury One-2-One has an ace up its sleeve. At launch in September, free off-peak local calls were announced for subscribers on its consumer tariff. The response was dramatic. Within the first two weeks of the announcement Mercury One-2-One handled 50,000 enquiries, over two-thirds of which were from people who had not previously used mobile phones.

With a £27 million advertising spend from the three players no doubt helping, both Cellnet and Vodafone recorded record numbers of connections in September. Mercury One-2-One has subscriber levels in the thousands after just one month (many on the consumer tariff) and is already suffering PCN handset availability problems.

The effects of competition have only just started. The national coverage advantage of the analogue networks, which currently allows them to charge a tariff premium of up to 70% more than PCN, will gradually be eroded. And Hutchison is to launch its PCN network in the second quarter of 1994 — with extended coverage across the UK.

Mercury One-2-One has already had a dramatic effect on the mobile scene in the UK. But that is not their target. The official line from Mercury One-2-One is that they are after BT's fixed network customers. And here the competition promises to be even more intense with the recent licensing of numerous new fixed network operators and the change in focus of cable TV operators towards providing telephony services.

Stuart Sharrock

The East is Ready

	NATIONAL PUBLIC NETWORK OPERATOR	NATIONAL DATA SERVICES	INTERNATIONAL VANS WITH OWN NODES	VSAT OPERATORS WITH DISHES INSTALLED	MOBILE TELEPHONE NETWORK
Bulgaria	Bulgarian Telecommunications Co. Ltd. (Sofia) 35-9-2-889-432	Sprint Business Communications Co. 35-9-2-889-432	IBM (Sofia), Scitor (Sofia, Vrajdebna), Sprint (Sofia)	ANT, DBP Telekom, Eurodata, Unisource	Bidding for licences in progress
Czech Republic	SPT Telecom Praha s.p. (Prague) 42-2-628-0331	Eurotel Praha spol.sr.o. (Prague) 42-6-01209950	BT (Prague), GEIS (Prague), IBM (Prague plus separate national net), Scitor (Prague)	ANT, DBP Telekom, Eurodata, France Telecom, Orion Net, Teleport Europe, Unisource	Eurotel Praha spol.sr.o. (Prague) 42-6-01209950
Slovakia	SPT Telecom Bratislava s.p. (Bratislava) 42-7-492929	Eurotel Bratislava spol.sr.o. (Bratislava) 42-2-7-254-303	BT (Bratislava), IBM (Bratislava), Scitor (Bratislava)	ANT, DBP Telekom, Eurodata, France Telecom, Teleport Europe	Eurotel Bratislava spol.sr.o. (Bratislava) 42-2-7-254-303
Estonia	Esti Telephone Co. (Tallin) 37-2-242-2442	Estpac (Tallin) 37-2-242-2442	Sprint (Tallin)	None	Estonian Mobile Telephone Co 372-242-2442
Hungary	Hungarian Telecommunications Co. (Budapest) 36-1-155-5567	Pleasedata (PTT monopoly) (Budapest) 36-1-155-5567	BT (Budapest), Scitor (Budapest), GEIS (Budapest), IBM (Budapest)	ANT, Banknet, DBP Telekom, Digitel, Eurodata, France Telecom, Hughes Network Systems, Sentel, Spaceline, Teleport Europe, Unisource	Westel Radiotelefon KFT (analogue only) 36-1-155-5567 Bidding for digital licences
Latvia	Lattelcom (Riga) 37-1-882-8000	None (Latpac no longer operating)	Scitor (Riga), Sprint (Riga)	ANT, DBP Telekom	Latvian Mobile Telephone Co PTT, Swedish Telecom International and Telecom Finland 37-1-882-8000
Lithuania	Lithuanian Telecom (Vilnius) 37-0-2-22-77-55	Lithuanian Datapak 37-0-2-44-31-66	None	None	Comliet UAB 37-0-2-22-77-55
Poland	Polish Telecom (Warsaw) 48-2-65-71-467	Polpac (PTT) (Warsaw) 48-2-65-71-467 Telbank (Warsaw) 48-22-10-20-51	BT (Warsaw, planned 1Q94), IBM (Warsaw), Scitor (Warsaw)	ANT, DBP Telekom, Eurodata, Orion Net, TSSA, Telbank (planned), Teleport Europe, Unisource	Polska Telefonia Komorkowa 48-2-65-71-467
Romania	Rom Telecom (Bucharest) 40-1-400-1202	Logic SRL (Bucharest) 40-1-311-0293	IBM (Bucharest, planned 4Q93), Scitor (Bucharest)	ANT, DBP Telekom, Eurodata, Unisource	Telefonica Romania (Bucharest) 40-1-400-1202
Ukraine	Ukrainian Telecommunications (Kiev) 70-44-229-8386	Infocom (Kiev) 70-44-212-3544	Scitor (Kiev) Sprint (Kiev, Odessa, Lugansk)	ANT, DBP Telekom, Eurodata, Romantis (planned), Teleport Europe, Unisource	Ukrainian Mobile Telephone Co. (Kiev) 70-44-220-1720

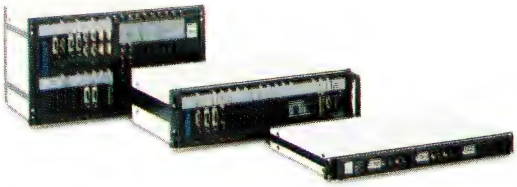
venture in Russia has been a big success, with over 4,000 customers, he said. Sprint intends to establish POPs in each large and medium-sized city in Eastern Europe.

Another option is to bypass the terrestrial infrastructure completely in favour of VSAT satellite services. VSAT networks offer sufficient bandwidth to handle voice and data, and also make it possible to deal with a single supplier for ordering and billing. On the downside, VSAT networks cost an order of magnitude more than national X.25 services.

At present, most European VSAT operators are working with star topologies, which means that traffic between dishes in Eastern Europe and a hub in Western Europe must be bounced off a satellite. A west-east communications link therefore comprises two components — a link to the hub (typically, a terrestrial line) and a satellite link from the hub to the dish in Eastern Europe. In some cases, the dish in Eastern Europe is shared by several customers. If this approach is taken, the quality of the terrestrial network is once again an issue since local circuits are needed between the dish and the customer premise.

VSAT hubs and dishes must be licensed by the national government. Operators typically get local suppliers, often the PTTs themselves, to install and maintain dishes.

Some countries such as Hungary and the Czech Republic, encourage foreign VSAT operators by keeping licence fees very low. The Hungarian Government also turns a blind eye to unlicensed dishes, according to some industry sources. As a result, a number of VSAT operators have dishes in these two countries. The high incidence of German operators can be explained by the experience they gained using VSATs to compensate for the lack of infrastructure in the former East Germany. Massive investment in terrestrial



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Eastern Europe

Building Corporate Nets the Hard Way

Thanks to heavy investment in telecom infrastructure by Eastern Europe's governments, 'capitalist tool' these days probably refers to X.25, cellular radios, or VSATs. Just a few years ago, the idea of extending a corporate network into Eastern Europe would have sent a shiver down the spine of most network managers. Judging from the region's antiquated public phone systems, they had good reason to worry.

The fall of communism did little to hearten anyone: those toppled statues of Lenin lying headless in parks and city squares were all too symbolic of an infrastructure in ruins. The prospect of deploying a private network seemed almost out of the question.

As it turns out, though, the situation is not nearly as grim as originally believed. Western companies began pumping cash into Eastern Europe soon after Vladimir Ilyich bit the dust. What they've discovered is that while public switched phone networks will take decades to modernise, private nets are proving far easier to install than expected.

And network managers have a surprising range of options available. National governments — hoping to speed economic recoveries — are investing heavily in their telecom infrastructures and rolling out a range of private networking services, including X.25 packet switching, cellular radio, and VSAT (very small aperture terminal) satellite communications (see table on page 24).

What's more, operators of international VANs (value-added networks) are extending their offerings into Eastern Europe, delivering data transport, e-mail and fax to Western companies not ready to open negotiations with local PTTs.

All in all, in fact, private networks are turning out to be something of a salvation for Western businesses, giving them a way to bypass the phone system entirely. And even when private nets only carry data — as is often the case — they still make it possible to send e-mail messages and faxes to those who can't be contacted by phone.

Telephone lines in Eastern Europe are at a premium. According to the International Telecommunications Union (ITU), Bulgaria, which boasts 26.92 lines per 100 people, is doing well by regional standards. Poland can only muster 10.31 lines per 100 inhabitants, while Albania is at the bottom of the scale with 1.30 lines per 100 citizens. France, by contrast, has 52.47 lines per 100 people, while Sweden has 68.19.

But be warned: building a private network in Eastern Europe has yet to reach the point at which it's easy or cheap. Generally, it's tough to get leased lines because PTTs need all the capacity they can get on their public networks to carry phone traffic. When available, leased lines are almost invariably analogue and are often poor quality.

There are some notable exceptions. Budapest-based Tungsram, a major lightbulb manufacturer, leases 2Mbps circuits from local firm Westel Radiotelefon KFT, which it uses to carry both voice and 64Kbps data. As well, Tungsram is installing microwave links between eight plants in Hungary, and already has a 64Kbps VSAT connection with the Netherlands data centre of UK firm GE Lighting Europe, its parent company. Westel Radiotelefon — a joint venture between the PTT, Hungarian Telecommunications Co., and US West — has installed a terrestrial network to support its cellular radio service.

Connection Woes

The scarcity of leased lines makes it tougher to use both national X.25 networks and international VANs. Each service relies on leased lines for the local loop between the operator's nearest switch and the customer site. "We've got a great backlog of orders that cannot be filled because the [leased lines] cannot be provided by [the PTT]," said Dick Lockwood, Chief Financial Officer of Eurtel Praha spol.sr.o (Prague) and Managing Director of Eurotel Bratislava spol.sr.o (Eurotel Praha is a joint venture between the Czech PTT, US West, and Bell Atlantic; Eurotel Bratislava involves the same two RBOCs and the Slovak PTT).

The quality of lines also affects performance. "We're lucky to get 9.6Kbps," said Robb Bracewell, General Manager and Vice President for Eastern Europe at Sprint International, a global VAN looking to develop X.25 nets throughout the region. Bracewell notes that Sprint deliberately uses modems that can step down to even lower speeds when they encounter particularly dirty lines. London-based Scitor, another international VAN, says it can offer 64Kbps access using radio modems, but says this is an expensive way of doing business. Further, getting permission to employ wireless gear takes time.

These potential troubles haven't affected the large US courier firm United Parcel Service, which has already extended its private X.25 installation throughout Eastern Europe and relies on 9.6Kbps dedicated access lines in Warsaw and Prague. "We have no problems with local loops," said Urszula Sowinska, Telecom analyst at UPS, who says Eurotel delivered its service within six weeks of her order.

But the problems appear to get worse away from capital cities, judging by the experiences of US agricultural and construction equipment maker Deere & Co. "You have to use a hodge-podge of anything you can get to make a connection," said Bill Coopman, Deere's Telecommunications Manager. In order to link up the plant of Zetor Tractor at Brno, about 100 miles southwest of Prague, Coopman had to dial into Eurotel Praha's X.25 network to access its own X.25 network.

In all Eastern European countries, X.25 networks are now treated as publicly available services. In some instances, they're integrated into and even replaced by higher-performance packet services from joint ventures like Eurotel. National networks also have been connected with one another and with X.25 networks in Western Europe so they can support international services.

Monopoly Capitalism?

In some countries, like Hungary, Slovakia, and the Czech Republic, monopolies have been granted to the network operators. But such exclusive contracts are not always ironclad: Eurotel Praha and Eurotel Bratislava fought and lost legal battles to stop IBM Eastern Europe Inc. from offering data services in the two republics. IBM's services make use of the spare bandwidth in the microwave network that links most major cities. It's operated by TV and radio broadcasters and used to ship programs between studios and antennas in most major cities. Eurotel still holds the monopoly for mobile radio.

In Poland, there's no data monopoly. Three licences have been issued, but only two operators are active, the PTT and Telbank, which services the banking and insurance industries. In Romania, two operators are rolling out national networks. One of them, Logic SRL in Bucharest, is a private company operating under an effective franchise from Sprint International. The other is a joint venture of France's Transpac and the national PTT, Rom Telecommunication, and has yet to go into commercial service. In the Ukraine, Germany's Controlware GmbH and a Ukrainian electronics firm have formed a joint venture called Infocomm GmbH, which has been granted a non-exclusive licence by the Ministry of Communications.

VAN Plans

Corporations not willing to go it alone have the option of working with an international VAN supplier. Right now, only IBM and Scitor have sufficient coverage to offer one-stop shopping for international services. Even then, they rarely have more than one point of presence (POP) in each country. Scitor is a subsidiary of Société Internationale de Télécommunications Aéronautiques (SITA, based in Paris), the operator of a global computer network for the airline industry. BT is planning to roll out its Global network Service/Tymnet VAN in some cities, starting soon. Infonet Services recently opened a Moscow point of presence and says it's planning to cover Eastern Europe through an alliance with an unspecified VSAT operator.

Sprint has much more ambitious plans for Eastern Europe. "It's our intention to have a national network in every country," said Bracewell. Sprint's data services joint

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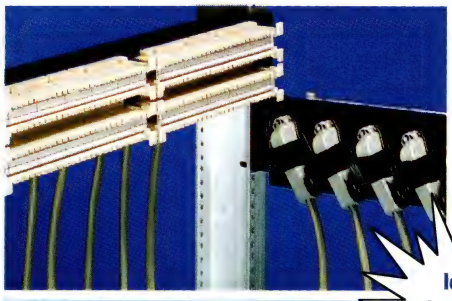

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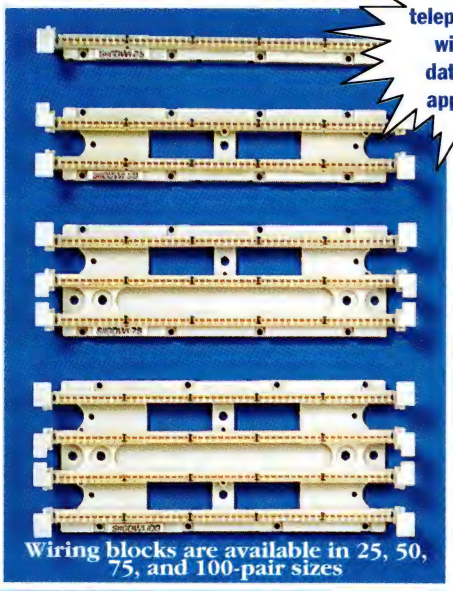

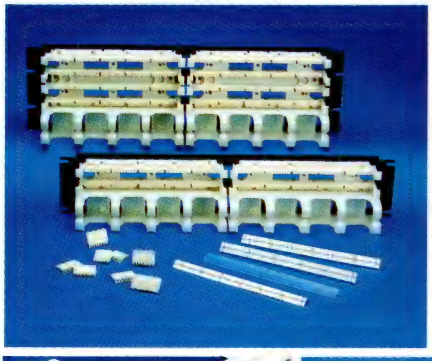

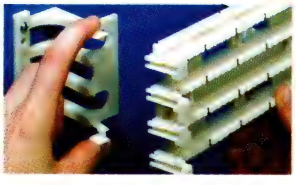

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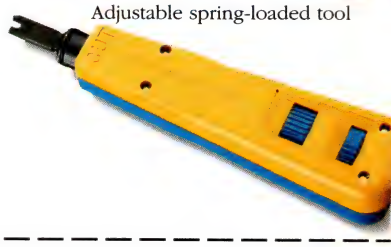

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Satellites

More Star Wars

In the last edition Stewart Fist wrote about the battle between rival satellite consortia for the use of geostationary orbital locations as 'a gentle battle between gentlemen — albeit with a bit of eye-gouging and groin-grabbing going on in the scrums.' Well the wraps are now well and truly off and the groin grabbing has been revealed for all to see (metaphorically speaking of course!).

On 16 September Pacstar, the satellite company part-owned by the Papua New Guinea Government, issued a statement in which John Kamblijambi, a Pacstar director representing the Papua New Guinea Ministry of Communications, accused the US satellite company, PanAmSat, of 'gross mischaracterisations' and 'false allegations' which he said were 'part of a despotic campaign to drive Pacstar out of business.'

Pacstar and PanAmSat are laying claim to the same orbital locations and are thrashing out the issue in front of the US Federal Communications Commission (FCC).

Pacstar's General Manager, (Ms) Kim Degnan, sent the author some more reports from the battlefront: filings to the FCC by lawyers acting for Pacstar. The usually dry legalese is enlivened with a few colourful swipes at PanAmSat from Pacstar's lawyer, Judith O'Neill of Steptoe and Johnson.

She describes PanAmSat's motion to the FCC claiming an orbital location with potential to cause interference to Pacstar's satellite as: 'Fast, loud, glib and packed with every perjorative innuendo which occurred to its drafter. It is reminiscent of the old adage that advises 'if you don't have the facts and you don't have the law, bang on the table'.'

PanAmSat's response was subdued. PR Director, Elizabeth Dickens, said 'we do not want to enter into a mud-slinging situation and we certainly do not believe that the FCC is the place to register fallacious statements and vent frustrations.'

Behind the mud-slinging lies an intractable problem, of which the Pacstar-PanAmSat slanging match is only one manifestation. Pacstar's Degnan has produced a list of all existing and planned geostationary satellites in the Asian region, showing where there are conflicts over orbital allocations.

In all there are 104 satellites in operation or planned between longitude 57 degrees east and 190 degrees east. Of these, 72 are in locations where they can cause interference, according to Degnan. In all she lists 25 separate orbital conflicts.

Policing of the use of orbital locations is handled at two levels. Each nation has the right to apply to the ITU's International Frequency Registration Board (IFRB) for orbital locations, and each nation must decide which operators it will allow to apply for and to use locations. At the national level governments can very effectively control companies within their jurisdiction, but at the global level if a country chooses to ignore the protocol of the IFRB a great deal of concerted international action would be required to impose any sort of sanction.

The only realistic solution is for the parties involved to negotiate solutions between themselves, and, according to former ITU Secretary General, Richard Butler, to share satellite resources. Butler told a conference in Korea recently that the present system was not sustainable with present technology, and that there should be shared use of satellite resources among different users.

Stuart Corner is the Editor of Exchange.

Satellites

A Buyers' Market

A spate of Asian-Pacific satellites designed to beam into and across Australia is creating a buyers' market for customers leasing domestic or international capacity.

Although Australia's regulatory regime requires that domestic satellite capacity be leased through the two licensed carriers until 1997, customers such as the ABC are already using this competitive environment to negotiate lower tariffs than those paid previously for either Optus or Intelsat capacity.

TRW, the US space and defence giant, is the latest entrant in the race. In September, it received Federal Communications Commission (FCC) permission to build, launch and operate PacifiCom-1 (PAC-1) covering Asia, the North and South Pacific and the US. TRW joins PanAmSat which is already marketing PAS-2 capacity through Asia and the Pacific for a start-up date early next year.

Alongside these companies is a group of Asian operators planning satellite footprints covering Australia in the 1995 timeframe. The Asian group includes Indonesia's Satelindo with Palapa C; China-led APT Satellite Co. with Apstar 2; and Hong Kong's Asia Satellite Telecommunications (part-owned by Cable & Wireless) with AsiaSat 2.

AsiaSat is reportedly negotiating a merger with the APT Satellite Co. The AsiaSat 2 and Apstar 2 satellites have almost identical coverage, and also a common investor through Hutchison Whampoa. AsiaSat has also recently reached an agreement with Shinawatra of Thailand regarding the disputed orbital positions for the AsiaSat 2, Thaicom 1 and Thaicom 2 satellites.

Liz Fell

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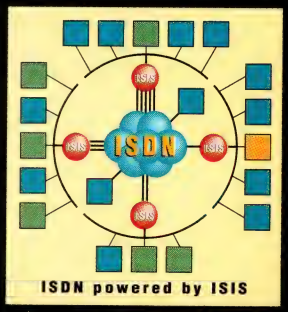

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While TRL staff were reluctant to talk publicly about their concerns, some insight came from Mark Sceats, Director of the Australian Photonics Cooperative Research Centre involving universities in Melbourne, Sydney and Canberra, whose organisation receives over $2 million in cash and kind from Telstra to develop photonic products.

"People at TRL were very worried about their jobs. But Dr Sorrentino's message has been that leaving research in Australia to the transnationals really meant there would be no research here at all. He's also been stressing that he wants to see Telecom continuing to nurture Australian companies, but in a more commercially focused way."

Sceats said Telecom, like most large corporations, was finding it extremely difficult to maintain in-house R&D programs and now wanted to get into joint ventures. "Telecom knows a change of approach is needed, but this doesn't have to be extreme. Also, we're an immature country when it comes to the commercialisation of R&D. For example, in rough terms, in most developed countries, the percentage of basic and applied research is about 50-50. But in Australia, we spend about 80% on basic research and 20% on applied, commercial R&D. Japan is the exact opposite and its R&D is focused on commercial goods for the market."

A statement issued by the new RIS group said TRL was running some 200-250 separate research projects, many of them begun prior to competition, and in future there would be fewer, but larger, integrated R&D projects aimed more clearly at adding value.

'TRL has been given a specific charter to be responsible for developing the future vision for the Corporation. This is an enhancement of TRL's role and a concrete indication of Telstra's commitment to R&D,' the statement said.

Confirming that Telstra had developed a closer relationship with Bellcore, the statement said the corporation would not contract out research. 'The relationship . . . with the US telecommunications research company is to formalise the sharing of information, so that Telstra does not 'reinvent the wheel,' and so that the corporation is kept up to date on the very latest international research.'

Kevin Morgan, National Industrial Officer with the Communication Workers Union, said all Telecom staff had a right to be nervous following the Jones report on TRL and the wider Coopers & Lybrand report on overheads.

"Because the shareholder, the government, decided to rip out 75% of Telstra's profits in dividends this year, Telecom is under severe financial pressure and the only ready area for cost cutting that they can see is employment. Of the 7,000 jobs that will go this financial year, about 2,000 are at risk in exchange operations and maintenance; another 2,000 in Consumer and Commercial, and about 400 in training," he said.

Morgan says that in-house training has always been a Telecom strength and potential source of competitive advantage. "All telecommunications carriers use basically the same equipment. It's how smart you use it that gives you the edge," he said.

Bernard Levy

United Kingdom

PCN Forces the Pace

Competition in the United Kingdom mobile market has been around for some time —in principle. In practice the battle has often been less than fierce. But the recent launch of Mercury One-2-One, the world's first PCN service, promises to turn a gentlemanly contest into open warfare.

After nearly one and a half decades of Tory rule, competition has become firmly entrenched in UK Government policy. In the telecoms sector competition has become an obsession, with the regulators handing out licences as if there were no tomorrow.

But early moves towards a competitive telecoms environment were cautious. British Telecom, now known as BT, was challenged by only one fixed network operator, Mercury. In the mobile arena just two cellular licences were awarded initially. Analogue cellular networks were launched in January 1985 by Cellnet, owned 60% by BT and 40% by Securicor; and Vodafone, then part of the Racal group.

By 1989 the analogue TACS networks had become a roaring success. Competition seemed to be working although, as with the fixed networks, the duopoly had become rather cosy. So the government decided to award more licences: four for telepoint, three for PCNs (Personal Communication Networks); and four for mobile data. Licences for the GSM digital standard were also awarded to Vodafone and Cellnet.

The consequences were disastrous. A total of three incompatible CT2 telepoint systems were launched — with inadequate coverage and pathetic marketing — and failed. The fourth telepoint licence, acquired by Hong Kong-based Hutchison Telecom, later launched to the CT2 Common Air Interface standard under the brand name Rabbit. But there is no other operator to be compatible with and the one-way system has not been well received, with, it is rumoured, about as many subscribers as base stations.

PCN also got off to an unpromising start. The recession did not help, making the prospect of investing a billion pounds in a new network less than attractive. And the PCN concept itself emerged as merely GSM at 1.8 GHz — allowing high capacity operation certainly, but not the technical breakthrough that was at first promised. Most members of the winning consortia wanted out and sold their stakes to whoever would buy. At the end of the shakeout period only two licences were left, held by Mercury Personal Communications (MPC), a joint venture between Cable & Wireless and US West, and Hutchison Telecom.

Real Competition

Cellnet and Vodafone started building their GSM networks but were faced with a dilemma. The main customers for GSM are business users, probably already subscribers on the analogue networks. As well as this internal threat to their existing, highly profitable subscriber base there was an external threat. The PCN networks now under construction would, by definition, be targeting the consumer market.

Accordingly, both Cellnet and Vodafone launched a pre-emptive strike against PCN to attract consumers onto their analogue networks. This could have been the beginning of real competition in mobile.

But the approach and offerings turned out to be almost identical. Towards the end of 1992 both Cellnet and Vodafone introduced 'low cost/low usage' packages aimed at the consumer market, with reduced connection and monthly subscription charges but high call tariffs. The entry fee to cellular was lowered but margins were protected by the high call charges.

Building a subscriber base of customers on the basis that they hardly ever use the phone may seem a strange approach but the response has certainly been good. Within a UK subscriber base of around 1.7 million, Cellnet now has over 160,000 subscribers on its Lifetime tariff and Vodafone nearly 130,000 on its equivalent LowCall package. The attraction of these low usage packages is simply the security offered by a mobile phone, they are not the packages needed for real penetration of the consumer market.

That is where PCN comes in. Mercury One-2-One launched in September but with the smart move of announcing its tariffs in July. Two options are available: one for business users with low call tariffs and high monthly subscription charges; and one for consumers with lower monthly subscription charges and higher call tariffs. The call tariffs announced were half those charged on the existing analogue networks.

Mercury One-2-One introduced other features designed to give it a competitive edge, including free voice mail and customer driven cost control options. And the cost of calling a One-2-One phone is half that of calling a phone on the analogue networks.

The disadvantage for Mercury One-2-One is that it only has coverage within Lon-

Continued on page 25

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Regulation

When Do Interests Conflict?

Former Austel Board Member, Johanna Plante, has reacted with both "surprise and amazement" to industry suggestions that her move from the telecommunications regulator to Pacific Star Communications potentially represents a conflict of interest. But her case does serve to highlight the relative ease with which Australian statutory public office holders and public servants can move into the private sector and put their connections to commercial use.

Plante, whose task is to boost Pacific Star's sales in Victoria and Western Australia, insists she has no information from Austel that could directly help in her new job as Account Executive.

Pacific Star is a Brisbane-based facilities management and software systems integration joint venture between the Telecommunications Corporation of New Zealand and Bell Atlantic. The company was incorporated in 1992 on the strength of winning a contract to run the Queensland Government's telecommunications network.

Industry observers say Austel's latest study of service providers and international resale is the only source of information which could compromise Plante in her new position. Plante insists that she deliberately excluded herself from that study in the knowledge that she was going to Pacific Star.

So, how do Australia's public sector confidentiality laws compare with those in the UK and the US? In Canberra, it's an open secret that the re-employment of retrenched public servants, often after hefty severance payments, and the re-hiring of former Australian Public Service staff as highly-paid consultants, is a shambles if not a rort. The discretionary powers lie chiefly with departmental or divisional heads. A Cabinet submission is being prepared by the Public Service Commission, propelled in part by embarrassing questions from Coalition leadership hopeful, Bronwyn Bishop.

In the US, the 'revolving door' syndrome remains a problem despite long-standing laws under which all ex-government employees are banned for up to three years from lobbying their former agencies or seeking contracts with those bodies on behalf of private concerns. In essence, the higher the position a civil servant has held, the more stringent the restrictions and the longer the duration. The laws have been tightened up considerably in the past five years following a series of scandals involving military contracts and former Defense Department employees, among others.

In the UK, the official barriers against cross-overs from telecommunications regulator, Oftel, to the private sector depend on the seniority of the staff member involved, and the company they are going to. Most Oftel staff are on secondment from the Department of Trade and Industry (DTI) and are bound for life by the *Official Secrets Act*.

According to an Oftel spokesman in London: "If it was a person in a very high position, such as an Assistant Secretary, the case would immediately be referred to a special parliamentary committee, the Diamond Committee, or the DTI, to check whether there was any undue impropriety, particularly if that person was going to a company Oftel was regulating."

So, will Johanna Plante be using her Austel connections or knowledge to further Pacific Star's expansion plans in Australia? "No, I have no regulatory role or interface with Austel at all. Pacific Star is a facilities manager, not a service provider or reseller. We don't buy bandwidth and resell it. We arrange the best deals we can for our clients based on our industry expertise."

Plante's CV is impressive and spans two decades: Telecom for 12 years; Coopers & Lybrand; Computer Power Group; Infonet; then Austel for the best part of four years. She sees her situation as no different to such players as Paul Villanti, formerly with Austel and now with Optus' Melbourne office; Paddy Costanzo, former DOTAC officer with close links to former Minister, Kim Beazley; or Andrew Adeogni, who moved from Austel to Optus. Former Austel Member Alex Arena's move to Hong Kong regulator, Ofta, also comes into the equation, as do former Austel Business Economics Manager, Chris Zull, and Interconnect Manager, Russell Emery, now also at Ofta.

"To tell you the truth, when I've moved from other jobs, like Corporate Strategy at Telecom or Coopers & Lybrand, I had a lot more confidential information there than I ever had in this context," Plante said.

"It's not only a question of the amount of confidential information, it's a question of how are you supposed *not* to pass it on. Are you supposed to never have another job in the industry? Was Austel meant to be a life sentence? Does Austel just appoint very old people who will never have another job? Honestly, I would have said no to Austel if I had been told I couldn't return to private industry for five years or whatever."

Plante believes it's important that the Australian regulator cycles industry professionals who can stay for a few years, then move on. "Otherwise the regulator can't be in touch with the real world. It will end up being run by public servants, which I don't believe is the best way."

"Also, I wrote a letter to the Chairman [Robin Davey] saying that I had noted the Public Service requirements on confidentiality and that I would be abiding by them. As a holder of public office, rather than a public servant per se, I didn't need to do it, but I put it in writing anyway."

Bernard Levy

Research and Development

Reorganising Telecom's Research

Telecom has been forced into damage control mode to allay fears about cutbacks and retrenchments in its research and development wing, in the wake of the recent rationalisation which saw the Telecom Research Laboratories and the Information Technology Group merged into the Research and Information Technology (RIS) Group.

In a climate where Telecom is committed to culling staff from the present 65,000 to around 50,000 by the mid-to-late 1990s, anxiety among R&D staff, mostly based at Clayton in Melbourne, is understandable. Those fears were fuelled by recent media reports based on a supposedly confidential study by former Telecom engineer, Phillip Jones, who was asked by Telstra to examine TRL's $60 million annual research effort on a project-by-project basis.

One media analysis hinted at big staff cuts, threats to TRL's very existence and the contracting out of research projects to such organisations as the US company, Bellcore, forcing the newly-appointed head of the RIT Group, Dr Bruno Sorrentino, to reject the report's claims and to give personal assurances to the 500-odd TRL staff.

But the executive summary of the Jones report pulls few punches: 'The current fragmentation of sponsored work into some two hundred projects has resulted in a scattering of the focus work, a lack of critical mass for achievement with most projects, and a low level of real commitment by the sponsoring branches. The selection of project directions has been driven largely from the bottom up, this is, by the project teams themselves, and very little by clients and by laboratory management. This has resulted in direction of work which is not clearly aligned with the priority requirements of Telecom. The allocation of resources to strategically important areas of work is insufficient in many cases, necessitating a redirection of resources into priority areas.'

The report lists Telecom's six highest priority areas as: end- to-end service quality assurance; broadband technologies and services; network evolution and planning (fixed and mobile); customer modelling (needs, packaging and markets); network management automation; and advanced customer applications.

SDH and ADSL Important

On the broader transmission front, the Big Four transmission companies are staunchly touting the quality of their products, particularly in the synchronous digital hierarchy (SDH) range, though their nervousness remains quite apparent.

Garry McCarten, Business Manager for Philips Public Telecommunications Systems, says it is "undisputed even by our rivals," that Philips has the world's leading SDH technology. "Philips started in SDH ahead of its competitors and was among the very first, if not the first, to deliver SDH products. Our SDH 2.5Gbps per second product was used for video transmission from the Barcelona Olympics last year, and we're almost ready to deliver our second generation, whereas our competitors are still producing their first generation."

McCarten says Philips has 35 engineers involved locally in SDH, some working in international development activity in Melbourne and Sydney, and this has been stressed in the company's re-tender to Telecom.

"Despite the fact that SDH is now the core technology for transmission, Philips, as the 10th largest electronics company in the world, is substantially bigger than SDH alone. We have not determined exactly what our strategy will be if we are not successful in the re-tender process," McCarten says.

Brendan McManus, General Manager of NEC Australia's Telecommunications Division, says Telecom is essentially asking its suppliers to "brush up" their SDH equipment and offers, along with their asymmetric digital subscriber line (ADSL) products.

"Telecom also wants to reduce the number of core suppliers so that they receive fully integrated, turn-key packages rather than ordering all the bits separately," he says. NEC would have to rate "very well" because of its Partnership For Development arrangements which date back to June, 1989 and a recent report to the Department of Industry, Technology and Regional Development shows that NEC is performing well above its obligations in research and development and exports, McManus contends.

"Our retender proposals involve extensive local content and the inclusion of Australian sub-contractors, particularly in the ADSL contracts."

Siemens points to its recently announced ADSL joint venture with AWA to deliver interactive, multimedia products, as a big mark it is favour. AT&T and Jtec, and two other groups, are also vying for the same $500 million contract to supply systems for transmitting Pay Television down copper telephone lines.

Clearly pitching to the Telstra Board, a joint statement from Siemens Chairman and Managing Director, Klaus Lahr, and AWA Group General Manager, Laurie MacKechnie, enthuses about 2,000 new jobs in Sydney and Melbourne and the stimulation of thousands more in installation and service provision.

"Siemens' local world-leading research on compressed digital video, [plus] our strength in synchronous digital networking, can now trigger local manufacturing for the Australian and export markets," Lahr says.

Tough Decisions

The man at the centre of the re-tender process, who will ultimately be responsible for making recommendations to the Telstra Board, is Gerry Moriarty, Managing Director, Network Products, who reports directly to Doug Campbell.

Moriarty insists Telecom has been totally professional and fair in calling for re-tenders only from its three established switching suppliers and four transmission suppliers, all of which he describes as world class. But he states bluntly that the entire telecommunications industry is facing an uncertain future and tough commercial decisions need to be made now to accommodate the rapid changes that will take place this decade and well into the next.

Just as Telecom was telling the industry earlier this year there would be 'no more free rides' on the export train, Moriarty, who has a background in broadcasting on both sides of the Tasman, told a recent meeting of communications scholars and executives at the Royal Melbourne Institute of Technology that Telecom's hand was being forced by the convergence of telecommunications, broadcasting and computing and the continuing deregulation of the global communications environment.

"We are facing change on a scale probably greater than most other organisations. Global competitiveness is forcing companies to look for innovative strategies to upgrade products and service quality and to be quicker to develop new markets," Moriarty said. "It would be premature to say whether there will a reduction in the number of core suppliers, or how any sub-contracting arrangements will work, but everyone involved in the project is on edge because there is so much at stake."

As AT&T's Network Systems Managing Director, John Stefanac, puts it: "Telecom wants a far higher commitment from vendors. The old days are over and suppliers are being asked to reinvent themselves and their products. Only those who can do that will be winners."

A long-time industry observer says the last thing Telecom needs is another supplier: "They've got such a heavy investment with their present suppliers already and the costs of retraining on new gear is enormous."

In the meantime, Christmas 1993 seems destined to be remembered as a time of enormous relief, or anguish, for Australia's telecommunications heavyweights.

Bernard Levy

International Resale

Anyone Seen a Good Resale Policy?

Austel's latest investigation, into international resale, seems to have drawn an emotive response from service providers in the international resale business. Peter Hutton, Managing Director of BT Australasia, was quoted in the *Exchange* newsletter saying that Telecom's criticisms (in its submission to Austel) were 'predicated on the assumption that foreign carriers are unethical, break the rules and can't be trusted.' He also hit back at another Telecom suggestion — that service providers be required to report to Austel on the configuration of their international resale networks and on their traffic balance — saying that: 'reporting for reporting's sake' would constitute an overhead that would be passed on to the customer. He also hinted that any uncertainty in the regulatory regime would reduce the incentive for companies like BT to invest in Australia.

Telecom however, is not accusing any service providers of any wrongdoing. Its submission to Austel's investigation (a draft of which is due in December) essentially:

- Sets out the ways in which a reseller of international services can siphon traffic and revenue away from a licenced carrier especially where that reseller has close links with an overseas carrier; and
- Points out that without equal reciprocal overseas access, the licenced carrier is not fighting on 'a level playing field.'

The submission calls on Austel to be duly vigilant in its overseeing of such services, as instructed by the Minister.

In November 1991, then Minister for Transport and Communications, Kim Beazley, issued a direction to Austel specifically requiring it to guard against service providers affilliated with overseas carriers exploiting this affilliation unfairly.

The direction required Austel to: 'Pursue the following policy goals in relation to the supply of an eligible international service:

a) Promoting and safeguarding a fair and efficient market in the supply of the service;
b) Ensuring . . . that the service is open to full competition;
c) Preventing misuse of market power or of an offshore regulatory status by foreign carriers or . . . by persons supplying eligible international services;
d) Preventing activities that might lead to a substantial lessening of competition in the supply of the service, or on a stream, or on a stream forming part of the service, including activities that may arise from relationships between: i) A person supplying an eligible international service and one or more foreign carriers; or ii) Two or more foreign carriers;
e) Preventing undue erosion of the practical rights of the carriers under parts 6 and 9 of the Act.'

Austel implemented this direction in a class licence which required enrollment by providers of services which Austel believed had the potential to thwart these policy goals. Service providers so enrolled, are required to provide information about their service sufficient to enable Austel to fulfill its duties in overseeing the service.

The Ministerial direction, however, also carried a caution for Austel. It must not impose restrictions on service providers 'beyond the minimum restrictions needed to impose the policy goals.' Austel was faced with the job of treading a fine line between insufficient and too much regulation. It was therefore almost inevitable that it would upset one or other party for allegedly applying the hand of regulation too lightly or too firmly. Telecom believes more firmness is in order.

Austel Too Lax?

The core of Telecom's submission is that Austel, in endeavouring to comply with this direction, has erred on the side of laxness and is not giving sufficient scrutiny to services to enable it ensure they conform to the defined policy goals, and furthermore has not adequately translated these policy goals into the licence conditions.

Austel's class licence requires enrollment by providers of services interconnected to the public network at both ends (these give the greatest scope for abuse of market power) and stipulates that these services will only be permitted where Austel finds them to be in the public interest.

Telecom, in its submission, says: 'Austel's current approach of only applying the public interest test to a service after a complaint has been made is problematic because no information on services is being included in the public register to enable parties to judge whether they should complain. It is preferable for Austel to determine that a service is not in the public interest before the service provider has commenced operations . . . Austel should pre-vet all proposed enrollments by carrier affilliated resellers for international services that involve double-ended interconnection and only allow services to proceed if there is a positive finding that the service is in the public interest.'

But isn't that what the ISPCL (International Service Providers Class Licence) says Austel should do? Yes, but that is not what DOTAC wants. Mike Hutchison, Deputy Secretary, Communications at DOTAC, told an IIR conference last year that "It is Government policy that all international resale services are viewed as being in the public interest unless and until an Austel investigation finds otherwise." He went on to say "Austel has a reserve power . . . to place restrictions on particular services where a need to do so has been proven."

Without adequate information Telecom is not in a position to launch complaints against specific service providers. So if no specific complaints have been received the current investigation may well be the first time that any real attempt has been made to assess whether some international resale services meet the pubic interest criteria.

But exactly how does public interest equate with the policy goals listed in the Ministerial direction? If a service is found to be detrimental to these goals then clearly it is not in the public interest. On the other hand is it necessarily in the public interest simply because it conforms to the goals of policy? Austel has issued no guidelines.

Stewart Corner is the Editor of Exchange.

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stands a fair chance of realising its hopes for its asynchronous transfer mode switching and transmission products beyond its intelligent network platforms for Optus and AAP and its multiplexer trials for MobileNet.

DSC's CEO, Graham Darley, sees his company's future business prospects with second- and third-level carriers and service providers riding the migration to broadband services. He believes Telecom may be confronting a dilemma between staying at the forefront of technology and optimising its Australian industry participation.

NorTel's Account VP, Graeme Barty, who's responsible for the re-tender response, says NorTel has "every reason to believe we will be competitive" with its DMS 100 product, also used by Optus and British Telecom for the NSW Government network.

His confidence is partly based on NorTel's alliance with local manufacturer, Exicom, an arrangement once described by former Industry, Technology and Commerce Minister, John Button, as a role model for multinationals operating in Australia.

"Telecom are tackling Optus head-on and have clearly broadened out with investments in media organisations. If we don't meet their requirements, they reserve the right to go elsewhere," Barty says. "They've given us a model percentage breakdown of deployment and ramping and we know exactly what their needs are in terms of product and business strategy."

Telecom's need for greater flexibility with suppliers — and more acute monitoring of its markets — is amply demonstrated by the recent scarcity of one of the most basic components for installing ISDN, a grey wall box called an NT1, produced solely by Alcatel in Australia. At the time of writing, there were some 350 left in stock, and no firm commitments for supply before February. For service providers relying on ISDN's growth, this was less than exhilarating news.

Who'll Take the Plunge?

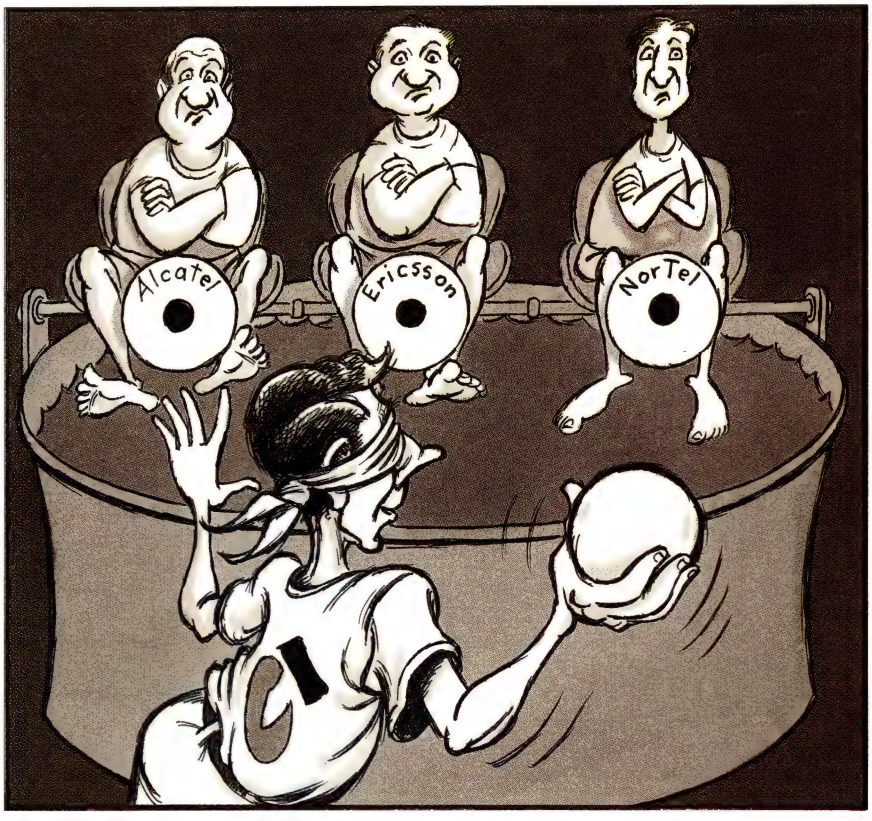
With Telecom intent on rationalising its supply base, the odds are that one of its three switch suppliers will lose out.

Jittery is probably the fairest description of the mood among Telecom Australia's switching and transmission suppliers, as they await judgement from the Telstra Board on their responses to this year's request for re-tender. Like nervous ticketholders in a lottery, they'll have to wait until close to the end of the year to find out what share they'll have of Telecom's $2 billion switching and transmission budget over the next five years.

In tandem with Telecom's Future Mode of Operation (FMO) study, the recalling of these core tenders represents potentially the most profound realignment of Telecom's commercial allegiances since the partial deregulation of the Australian market.

While Telecom has invited only its present three switching suppliers and its four transmission suppliers to re-tender, the stress level has been heightened by statements from Telecom Group Managing Director, Network and Technology Group, Doug Campbell, and the frequency of media reports strongly suggesting that the number of switching and transmission suppliers is to be cut back by some unspecified number.

All of the companies involved — Alcatel, Ericsson and NorTel in switching, and NEC, Philips, Siemens and Alcatel in transmission — are publicly putting on their bravest and most optimistic faces. But privately all are busily studying contingency plans, just in case they draw the short straw. Strategic alliances amongst themselves are not out of the question, though there are some fairly obvious corporate and cultural obstacles.



A Timely Switch?

Ericsson has submitted "the most comprehensive bid we've ever put in," according to Manager, Business Analysis, Jimmy Lynch. "The re-tender documents were attuned to world best practice and the needs of local industry, where we've been industry leaders. Telecom's ultimate aim is to accelerate the digitisation of its network, including the main exchanges, the public switched network and the intelligent network environments. In real terms, the cost reduction in supporting one less national switching technology would have to be considerable. But come hell, high or low water, Ericsson should be in there."

Asked whether Ericsson Australia might consider winding up its local operations if it were not selected for the big Telecom contracts, Lynch says: "In the unlikely event that the Telstra Board does not favour us, we certainly still have a commitment to Telecom and Vodafone as well as to our private market activities and our very pleasing and growing export markets."

Alcatel Australia, back to tender three years after being awarded an initial $72 million contract based on its System 12 product to supply urban and rural switches for the public network, has responded aggressively to Telecom's re-assessment of its needs. But Alcatel must be feeling nervous about its stated $100 million investment in manufacturing plant at Liverpool, near Sydney, which also produces QPSX MAN products under the Alcatel MAN brand name.

Amid industry sniping about the performance of System 12 and its GSM products, Alcatel's Chairman and Managing Director, Bill Page-Hanify, points to the broader picture. "When you look at our business and a recent business magazine's Top 500 exporters, and when you exclude Australia's primary and resources-based industries, Alcatel is the fourth largest industrial exporter after IBM, Holden and Ford. I'd reckon on that basis our strategy is working," he says.

Questioned whether the company could remain afloat locally without Telecom business, Page-Hanify's response was: "I'd have to make the obvious point that exports have got to be domestic-based."

But Page-Hanify knows only too well that waiting in the wings are companies such as DSC Communications, with its smaller switches, muxes and analogue-digital cross connectors; and AT&T with its 5ESS range. DSC already supplies Optus, AAP and Clear Communications with public switches supporting intelligent networks. While AT&T has no switching outlets in Australia as yet, the US giant is making a big push into Asia.

On any potential threat from these companies Page-Hanify says: "We know we have products that match theirs line-by-line. But if certain established products didn't meet the criteria, Telecom would have to be crazy if they didn't consider alternatives."

Ericsson's Jimmy Lynch, while pointing out that AT&T and DSC Communications are not part of the re-tendering process, concedes that "AT&T will play a role in the Australian and regional context out of Australia," and that in the broadband area, DSC

"We can sell the Tennis Centre (16,000 capacity) in about 20 minutes."

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In Brief

Qualcomm has announced the signing of multi-million dollar equipment licence agreements with four major Korean manufacturers — Goldstar, Hyundai, Maxon and Samsung. Under the agreements, Qualcomm has granted worldwide Code Division Multiple Access (CDMA) licences for the manufacture and sale of CDMA digital wireless phones. Qualcomm will receive licence fees and royalties on equipment sold by the manufacturers.

Philips has signed a four-year contract with Telecom New Zealand for the delivery of SDH transmission equipment, which will be used to enhance Telecom's digital network.

Eunetcom, the joint venture managed network company established by France Telecom and Deutsche Bundespost Telekom will begin operating its own services early next year. Eunetcom's Board recently appointed Claude Oliver as CEO.

MCI has announced the commencement of service on the new TAT-11 fibre optic submarine cable system linking the US with France and the UK. TAT-11 is a 560Mbps system providing 15,120 phone circuits capable of handling 60,000 simultaneous conversations, or a combination of voice, data and video.

Deutsche Bundespost Telekom will lead a consortium which also includes Cable & Wireless and Ameritech to bid for at least 30% of Hungary's national operator, Matav. Other companies reported to be interested in Matav include France Telecom, Italy's Stet, Japan's NTT, Southwestern Bell and US West.

Cabletron Systems has reported record operating results for its second fiscal 1994 quarter ending August 31, 1993. The company recorded net sales of $US141.9 million for the quarter, an increase of 47% over the same quarter last year. Net income rose to $US28.3 million compared with $US19.3 million in the comparable quarter of the previous fiscal year. Worldwide sales for the first six months of the fiscal year rose to $US273.4 million, a 48% increase over the first six months of the last fiscal year.

Radiola Corporation Limited, formerly AWA New Zealand, has announced it has signed an agreement with Telecom New Zealand to supply cable television equipment for Telecom's Fibre-in-the-Loop project in Auckland. The FITL system went live in October, and will offer pay-per-view and video-on-demand services as well as access to data and voice networks.

BT has announced its intention to form a joint venture company with Spain's Grupo Satander. The new company will own and operate Banco Satander's nationwide data communications network in Spain, and plans to offer a range of BT's managed data communications services to over 31 cities throughout Spain.

Ericsson's Indian operation, Ericsson Telecommunications Private Ltd, has received its first order for an AXE switching system. The order for 100,000 local phone lines has come from the Department of Telecommunications in New Delhi. The system includes ISDN facilities, and delivery will be completed in six months.

Northern Telecom's proposed joint venture with Germany's Bosch in the area of public transmission systems will be abandoned. The deal is reported to have fallen through because of recent unexpected losses by Northern.

Vodafone in the UK is to buy Air Call Holdings from BellSouth, in a deal that will make the company the second largest paging operator in Britain, with over 200,000 subscribers.

Air Call has agreed to work with Apple Computer on the development and marketing of a messaging service for the Newton Messagepad. The service, which will include sophisticated messaging facilities and access to a wide range of information services is expected to be launched in the UK in early 1994.

Mercury has been granted licences by the DTI to launch the trial of its digital Terrestrial Flight Telephone System known as Flightlink. The system, which will enable air passengers to make telephone calls, send faxes and data, play computer games and perform mail order shopping, will be available throughout Europe.

Datapoint is seeking royalties on switched videoconferencing technology and applications, which it claims are covered by both US and foreign patents. The company has said it is also reviewing patents covering other kinds of videoconferencing products.

Bell Atlantic Seals Mega-Merger

Bell Atlantic last month stole a march on its RBOC rivals in the multimedia stakes by announcing its plans for a $US23 billion merger with giant US cable TV company, Tele-Communications and its cable programming subsidiary, Liberty Media. The deal, if it goes ahead, will create the sixth largest corporation in the United States, with assets of over $US60 billion.

Prior to the merger, Tele-Communications had captured 25% of the US cable TV market and had plans to spend over $US2 billion on laying fibre optic cable to US homes. With the addition of guaranteed access to Bell Atlantic's customers, the new merged company will have access to 42% of US homes, according to some reports.

The deal requires ratification from several US Government agencies before it can go ahead, among them the Federal Trade Commission and the Justice Department, which will be required to examine whether it contravenes anti-trust laws.

The US Federal Communications Commission has also instituted an inquiry although FCC Chairman, James Quello, sounded positive about the deal in his first comments after its announcement, reportedly describing it as "the most momentous deal of the decade."

UK Issues New Carrier Licences

The UK Department of Trade and Industry (DTI) has issued four new telecommunications licences — three for the operation of telecommunications services, while the fourth is an International Simple Resale (ISR) licence.

The operators licences have been gained by Scottish Power Telecommunications Ltd; Torch Communications; and MFS Ltd, a subsidiary of US-based MFS Communications. The ISR licence was won by Esprit Telecom UK Ltd, which is owned by Canadian manufacturer Mitel.

The three new operators are planning to offer regional services only at this stage, with Scottish Power operating in Scotland, Torch in Yorkshire and the Pennines region, and MFS in London. The ISR licence, which permits connection to public networks of international leased circuits, allows Esprit to offer ISR services between the UK and Australia, Canada and Sweden.

Trade and Technology Minister, Patrick McLoughlin, said the DTI hopes to issue further licences later this year.
(Telecom*europa*)

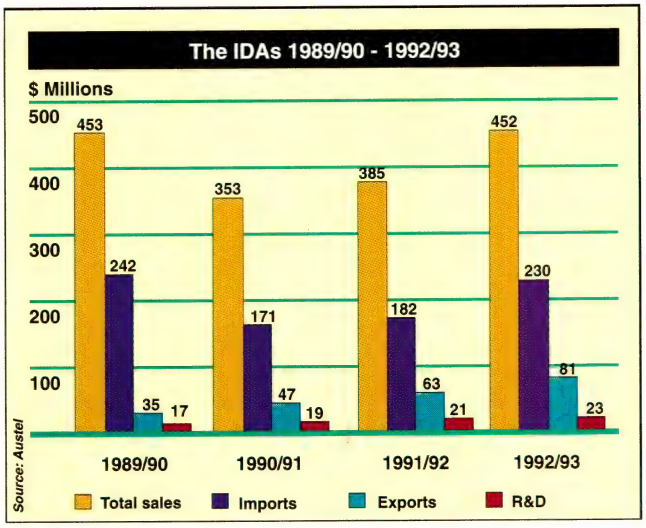
Mercury, BT Sign Cable TV Deals

Both Mercury Communications and BT have announced the signing of agreements with the Cable Operator Strategy Group (COSG) for the use of their national networks in the provision of cable television services.

Mercury has reached a three-year Marketing and Operations agreement with COSG, which represents Encom, Nynex Cablecomms, General Cable, Videotron, Telewest Communications, and Southwestern Bell.

Under the terms of the contract, Mercury will provide interconnection, operator services, directory inquiry and emergency services, assist in the development of new products and services, and participate in marketing and promotional activities.

The five-year BT agreement with COSG, which follows 18 months of negotiations, is significant in that until now all but three cable operators had exclusive deals with Mercury. Under the terms of the deal, BT will provide both interconnection and transmission of calls as well as emergency and basic national and international services. BT says the deal is potentially worth tens of millions of pounds.
(Telecom*europa*)



Mixed IDA Results for Year Four

Unfazed by some very mixed results, Austel has expressed its belief that the Industry Development Arrangements are working following the release of its Year Four IDA report.

Aggregate sales turnover has returned to the first year level while research and development expenditure as a percentage of turnover has grown. Imports have fallen slightly from 53% of turnover in 1989/90 to 51% in 1992/93, but exports have grown significantly to reach $81 million or 17.9% of turnover.

Less rosy results were recorded in average level of local content achieved in exports, which fell from 45.6% in the first year to 40.3% in 1992/93, and in Australian production which has declined from $369 million to $330 million. Local content in Australian production also fell from $127 million in the first year of the IDAs to $100 million last year.

Optus Reaffirms Spending Plans

Despite varied preselection ballot results, Optus Communications' latest report to the Federal Government reaffirms its commitment to its investment targets over the next four years.

Optus snared 12% of subscribers in the initial preselection ballot in Canberra and a predicted 18-19% share after two ballot rounds in Sydney. However, returns from the first Melbourne ballot were only reported to be 10.5%, prompting Optus to call for a second ballot in the Victorian capital.

Optus has spent a total of $986.2 million in its 1992/93 financial year, including capital expenditures of $512.2 million. It plans to invest another $5 billion over the next four years.

The figures were released in Optus' Annual Report to the Minister for Industry, Technology and Regional Development, which it is required to submit as part of its licence conditions.

The report stresses the importance of Optus' partnerships with its suppliers, which include Digital, NorTel, Fujitsu, Nokia and Leighton Contractors. It says Optus and its suppliers will spend around $400 million over the next 10 years on R&D — 85% of which will be undertaken within Australia.

Optus has also committed to spending at least $100 million over the next five years on the establishment of an education and training programme, including the development of the Optus Strategic Education Alliance (previously known as the Optus Training Institute).

The company reported that its workforce has grown to over 2,400, and said it has indirectly created a further 1,070 jobs as a result of its activities.

In Brief

Matrix Telecommunications, through its 77.8%-owned subsidiary Matrix Asia, has entered a joint venture deal to establish 108 paging centres in China. Matrix Asia will have a 20% stake in a company formed with Malaysia's Metroplex Berhad, and this company will own up to 60% of a joint venture with Beijing Catch New Technology Development Corporation.

Telstra has signed a joint venture agreement in China to develop satellite system technologies. The deal was signed in Beijing with the Chinese Academy of Space Technology (CAST). Under the agreement Telecom and CAST will develop and market technologies for satellite systems, starting with satellite earth station terminals, within China and the Asian region.

Optus Communications has launched its long distance service in Perth and the Pinjarra region of Western Australia. The company spent almost $38 million in capital expenditure in WA in 1992/93, and plans to spend another $23 million in 1993/94.

Communitron, an Australian manufacturer of telecommunications products, has won a $4.5 million contract to supply Telecom with microprocessor-controlled registers which will be used to control the flow of calls in and out of an exchange, and to provide more comprehensive billing information to customers.

Mitec has been selected by Martin Marietta Astro Space to supply triple redundant master oscillators for IntelSat's new generation Series 8 satellites. The contract is initially for two satellite sets, with an option for further quantities.

Nokia has chosen Clear Technology for the design, supply and installation of an integrated communications network for its Australian and New Zealand offices. The contract involves the supply of LANs for Nokia's Sydney, Melbourne and Auckland sites.

TITAB, the Telecommunications Industry Training Advisory Board, has been launched by the Minister for Schools, Vocational Education and Training, Ross Free. The Board will be involved in telecommunications training and education activities.

BT will supply sophisticated video compression and telecommunications technology to the Whitbread Round the World Ocean Yacht Race. Cameras mounted onboard yachts will capture the action, which will be able to be broadcast anywhere in the world within hours, via the Inmarsat satellite network.

Saturn Global Network has opened a Facilities Management Centre in Melbourne, and has commenced offering a comprehensive Facilities Management Service to Melbourne customers.

SITA has won a five-year $60 million communications network contract with Travel Industries Automated Systems (TIAS). TIAS is owned by Qantas, Air New Zealand and Ansett Australia, and provides infrastructure for the distribution of both the SABRE and Galileo computer reservation products.

AARNet has doubled the capacity of its US link to 1.5Mbps by switching from satellite to the PacRimEast cable. AARNet Technical Manager, Geoff Huston, said data will now travel six times faster, taking just one-tenth of a second to cross the Pacific.

Telecom has announced the commissioning of its Satcom-Maritime system at its Perth Land Earth Station (LES). The carrier says it can now provide Satcom-M and land-mobile satellite communications services to remote locations across Australia.

Mitec has won an Optus supply contract worth over $1 million for the provision of Ku-band satellite frequency conversion equipment. The equipment, which is Australian designed and will be manufactured at Mitec's Brisbane factory, will be integrated into five major city earth stations to provide overflow and restoration capabilities for national long distance traffic.

Optus Communications last month commissioned its $6 million Adelaide Exchange as part of its planned $70 million expenditure in South Australia by June next year. Optus Long distance services commenced in Adelaide in early October.

Leighton Contractors says it has invested over $1 million in research and development of new techniques and technologies for Optus projects. The company has completed Optus contracts valued at $146 million during the last financial year.

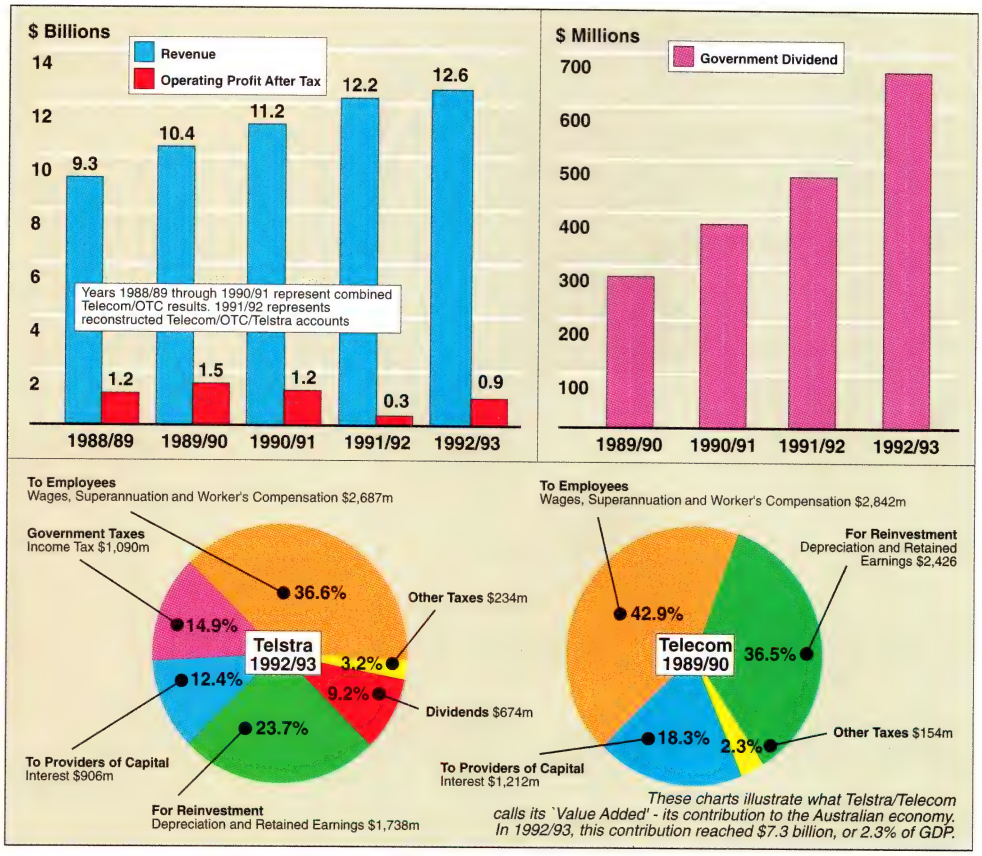
Telstra Posts $904 Million Profit on $12.65 Billion Revenues

After what Chairman, David Hoare, described as "the first significant effects of competition," Telstra has posted an after tax profit of $904 million for the 1992/93 financial year. The result was achieved on revenues of $12.65 billion, an increase of only 3.5% over the previous year, and a $910 million fall in expenses to $10.66 billion. Operating expenses actually rose from $10.1 billion to $10.29 billion, as did operating profit, up 11% to $2.35 billion.

In his forward to Telstra's annual report, Mr Hoare said that Telstra faces levels of risk and uncertainty "significantly higher than normal in competitive markets" because of outcomes beyond its capacity to influence. He warned that the benefits of telecommunications deregulation will be prejudiced unless the Government strikes an appropriate balance on a continuing basis between the competing players. At the moment "it could be argued that nowhere else in the world has there been a market tilt on such a scale against the incumbent."

Capital investment for the year declined almost $300 million to $2.7 billion, while total network growth was 3.4%, with the number of telephone services in operation at the end of the year 8.54 million. More than $360 million was allocated to cover redundancies in 1993/94.

Despite Mr Hoare's warnings, Telstra's Board has recommended a dividend of $674 million, up substantially from the $478 million contributed to Government coffers in 1991/92.



These charts illustrate what Telstra/Telecom calls its 'Value Added' - its contribution to the Australian economy. In 1992/93, this contribution reached $7.3 billion, or 2.3% of GDP.

Jtec Wins Major BT Contract

Jtec has won an export contract potentially worth up to $40 million for the supply of its J1000 Series ISDN Access Controllers to BT in the UK. The products will then be sold as part of BT's own product portfolio. BT will also help Jtec in setting up European distribution channels.

Jtec won the contract in competition with 16 other companies from around the world. It follows the signing of a $13.5 million deal with BT in August for the supply of Jtec ISDN multiplexers to BT's Australasian subsidiary for use in the NSW Government network.

According to BT Australasia's Programme Director, Les Harris, BT's stringent selection process had clearly showed that Jtec's advanced ISDN technology products were the best in their class.

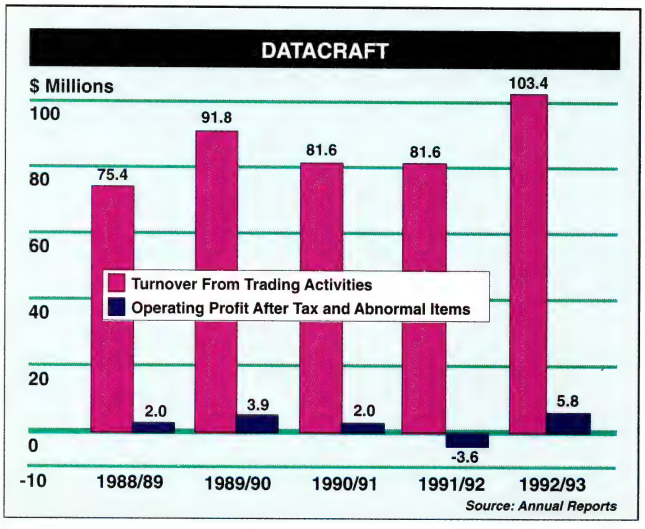
Datacraft Boosts Performance

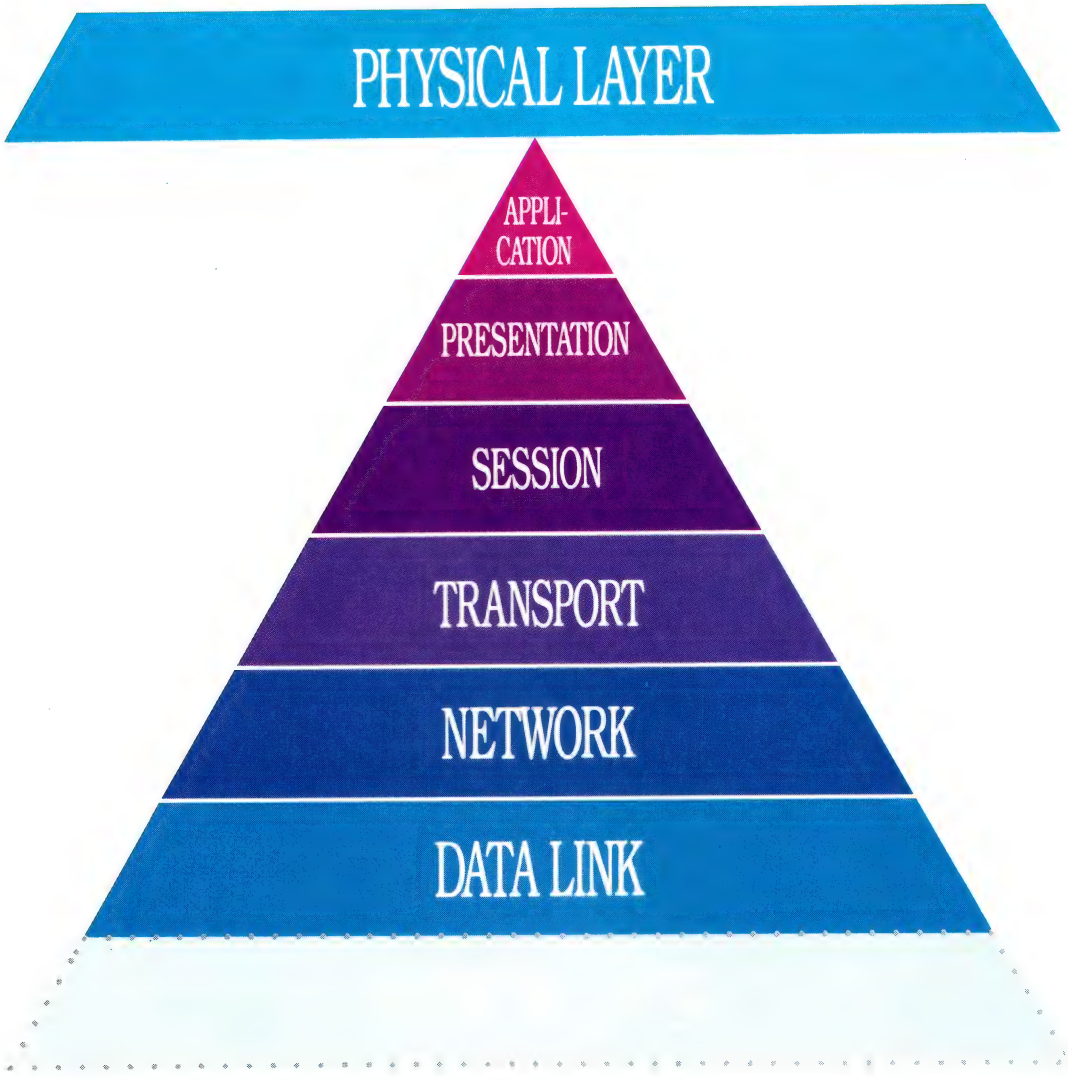
Datacraft has recorded a 266% profit turnaround for the 1992/93 financial year, reporting an after-tax profit of $5.8 million. The figure compares to a $3.6 million loss for the previous financial year.

Worldwide Group sales revenues for the year were $103.4 million, an increase of 27% over the same period last year. Pre-tax operating profit before abnormal items, such as the restructuring and partial sale of the company's Asian operations, was $3.7 million, compared with a pre-tax loss of $1.1 million for the previous 12 months.

Revenues for the company's Australian operations rose 32% from $41.5 million to $54.8 million, comparing favourably with growth in overseas revenues, which rose by 21%.

Asian operations continued to grow rapidly during the year, and showed a 30% increase in revenues and comparable increase in profits. China, Malaysia and Thailand were areas of particularly strong growth, the company reported.





Are you making physical layer decisions a top priority?

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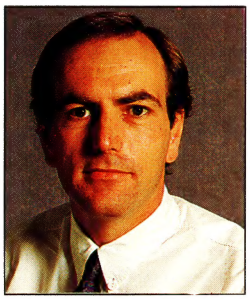
A Cosy Mobile Duopoly Already?



In amongst his policy deliberations, Communications Minister Beddall (see Liz Fell's interview starting on page 63) would do well to revisit the mobile communications arena. With the launch of Vodafone, Australia theoretically now has the three operators thought necessary to prevent the development of a cosy Telecom-Optus duopoly. Unfortunately, that cosy duopoly may well be in the making in any case as a result of the Government's attempt to regulate technology by requiring Vodafone to operate a digital network from scratch.

The analogue mobile network continues to grow at a great rate, apparently unhindered by the capacity problems previously thought to necessitate the early introduction of GSM digital technology. According to Telstra's latest annual report, Telecom now operates the fifth fastest growing cellular network in the world. In mid-1991, there were less that 300,000 MobileNet customers. Now, a little over two years later, Telecom and Optus are approaching a combined customer base of three quarters of a million.

With this explosive growth it's not surprising that neither carrier has made strenuous efforts to promote their respective GSM services, and after a flurry of launch-related advertising, things have gone fairly quiet.

Why would they? The usage growth rates would have to indicate that people are happy with the analogue service, and reports of there being only a little over 1,000 GSM users do nothing to suggest otherwise. The analogue network now provides coverage to over 85% of the population, so for Telecom much of the infrastructure investment has already been made. And for Optus, which happily resells MobileNet capacity, it's never been an issue. So why would they want to spend money rolling out and promoting GSM? Why not milk the analogue cash cow for all it's worth? And from a competitive strategy point of view, why do anything which will indirectly benefit Vodafone?

Vodafone faces the challenge of convincing the ever-growing band of happy analogue users that it's worth paying more money to switch to digital and away from analogue. Why would Telecom and Optus — the duopoly analogue providers — want to help out? The simple fact is that every dollar Telecom and Optus spend promoting their respective GSM services will reinforce Vodafone's line about digital superiority. Why would the duopolists help the interloper to gain a slice of an expanded digital market when it means a diminution of their own analogue subscriber base? Better to go quietly on digital while counting the analogue profits.

So spare a thought for Vodafone. The UK company has paid $140 million to operate Australia's third cellular mobile GSM network and made a commitment to spend $500 million over the next several years bringing it into full scale operation. As things presently stand, it will face an extraordinarily tough task to gain a return on this investment.

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AUSTRALIAN communications

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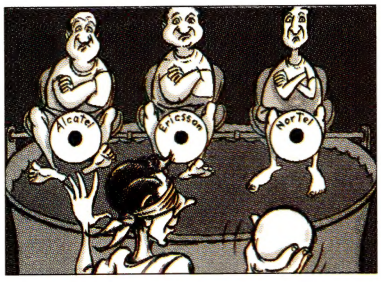
FRAME RELAY 105

Is frame relay in grave danger of being consigned to the 'over-hyped, but under-used' category of networking technologies? First touted a few years ago as the next big thing, take-up of the technology has been slow in the US and almost non-existent elsewhere. So has its time passed already? Market history indicates that every technology has a window of opportunity. Frame relay's window of opportunity is now. If the technology has not significantly increased its market share by 1995, then it may never be a big force in the marketplace in its own right. But does this mean frame relay will disappear? This is unlikely, as there is a sound future for frame relay as an interface technology to ATM and 802.6 networks.

ANALYSIS



TECHNOLOGY

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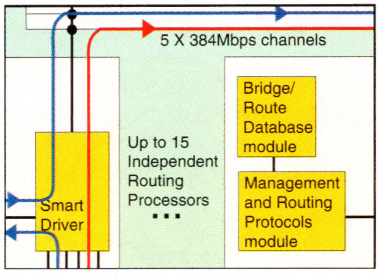
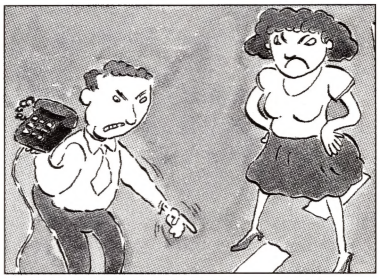


OPINION

INTERVIEW

LEGAL LINE



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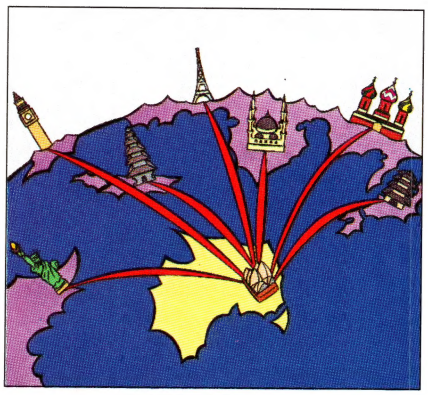

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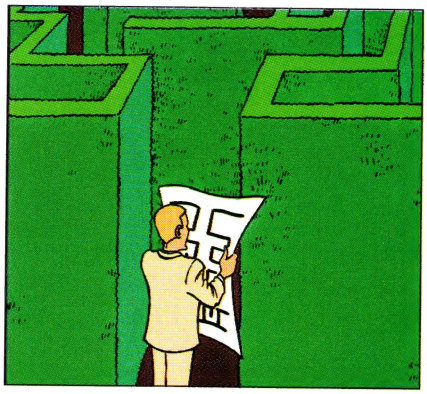
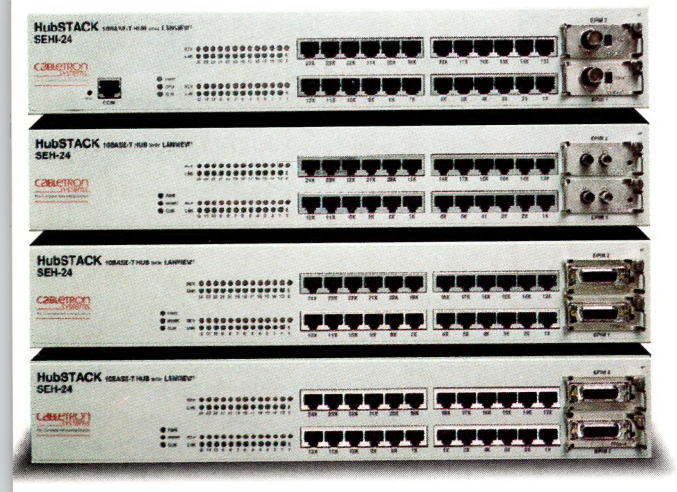
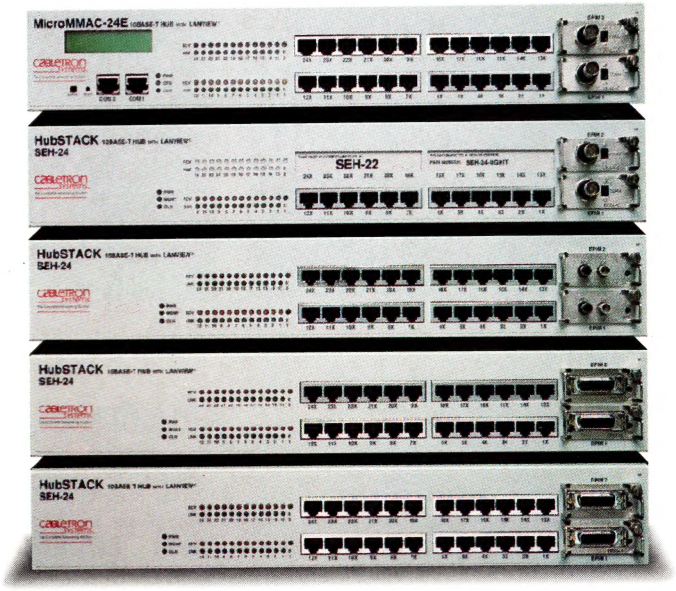


THE STACK

HUBS WITH INTEGRATED BRIDGE/ROUTING.





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